



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

GENERAL LIBRARY

OF

University of Michigan

Presented by

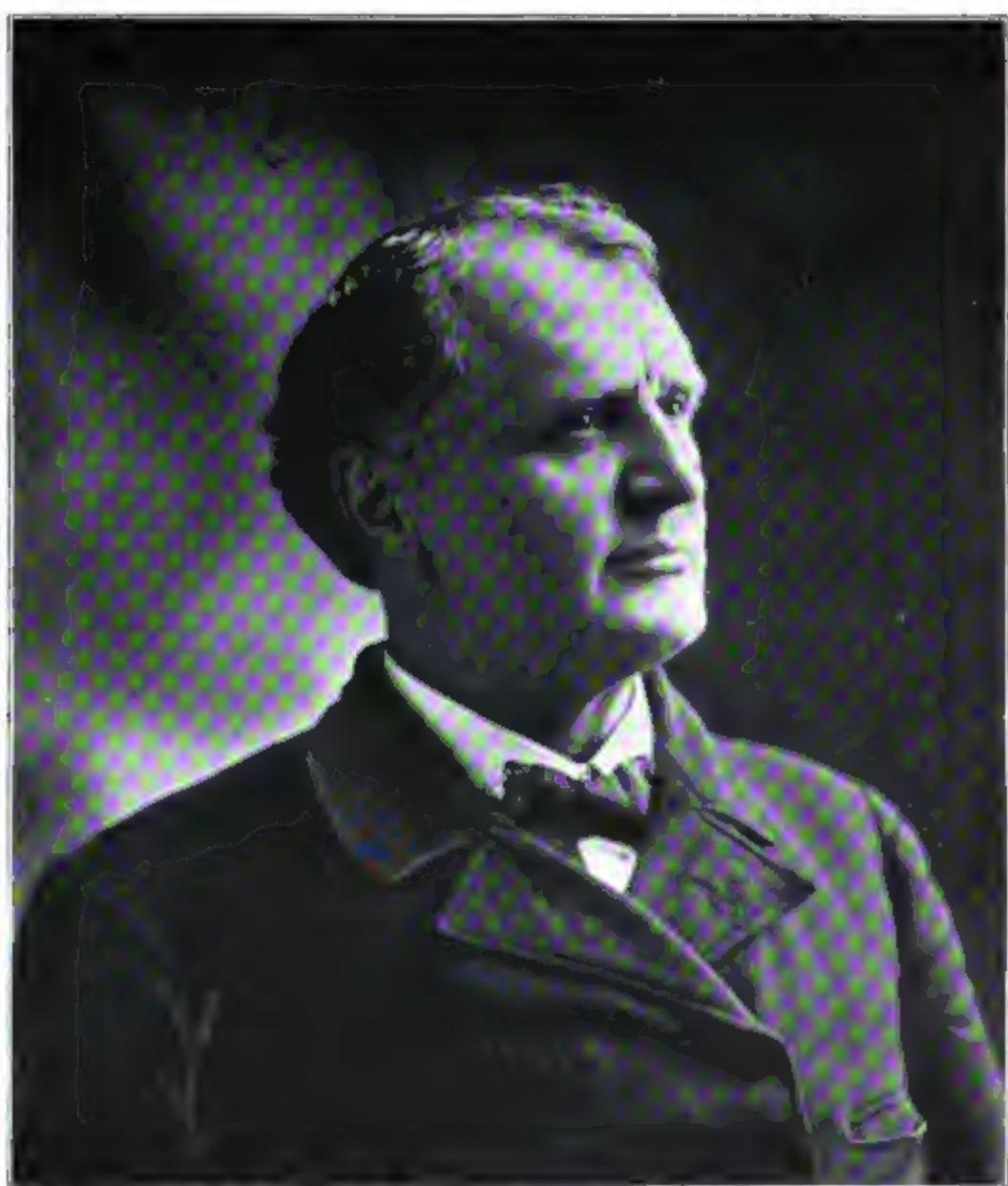
State Library of Indiana

11/17

1900

S
59
A3

... in ...



Harold H. Stevens

FORTY-NINTH ANNUAL REPORT

OF THE

Indiana State Board of Agriculture

77525

VOLUME XLI—1899-1900

INCLUDING THE

Proceedings of the Annual Meeting, 1900; Reports of County and District Societies, State Meetings of Swine Breeders, Wool Growers, Corn Growers' Association, Farmers' Institutes, Experiment Station, Farmers' Insurance Union, Statistics on Vegetables and Cereals, State Dairy Association, Special Report on the Hog, etc., etc.

TO THE GOVERNOR.

INDIANAPOLIS:

WM. B. BURFORD, CONTRACTOR FOR STATE PRINTING AND BINDING,
1900.

STATE OF INDIANA,
EXECUTIVE DEPARTMENT,
INDIANAPOLIS, May 19, 1900. }

Received by the Governor, examined and referred to the Auditor of State for verification of the financial statement.

OFFICE OF AUDITOR OF STATE,
INDIANAPOLIS, May 21, 1900. }

The within report, so far as the same relates to moneys drawn from the State Treasury, has been examined and found correct.

W. H. HART,
Auditor of State.

INDIANAPOLIS, May 21, 1900.

Returned by the Auditor of State, with above certificate, and transmitted to Secretary of State for publication, upon the order of the Board of Commissioners of Public Printing and Binding.

CHAS. E. WILSON,
Private Secretary.

Filed in the office of the Secretary of State of the State of Indiana, May 21, 1900.

UNION B. HUNT,
Secretary of State.

Received the within report and delivered to the printer, May 22, 1900.

THOS. J. CARTER,
Clerk Printing Bureau.

MEMBERS
OF THE
Indiana State Board of Agriculture
1899.

- 1st District—JOHN C. HAINES, Lake, Spencer County.
2d District—MASON J. NIBLACK, Vincennes, Knox County.
3d District—W. W. STEVENS, Salem, Washington County.
4th District—E. A. ROBISON, Rocklane, Johnson County.
5th District—H. L. NOWLIN, Gullford, Dearborn County.
6th District—KNODE PORTER, Hagerstown, Wayne County.
7th District—H. B. HOWLAND, Howlands, Marion County.
8th District—CHARLES DOWNING, Greenfield, Hancock County.
9th District—W. T. BEAUCHAMP, Terre Haute, Vigo County.
10th District—JOHN L. DAVIS, Crawfordsville, Montgomery County.
11th District—M. S. CLAYPOOL, Muncie, Delaware County.
12th District—MORTIMER LEVERING, Lafayette, Tippecanoe Co.
13th District—JOHN L. THOMPSON, Gas City, Grant County.
14th District—COTT BARNETT, Logansport, Cass County.
15th District—AARON JONES, South Bend, St. Joseph County.
16th District—JAS. E. McDONALD, Ligonier, Noble County.
-

OFFICERS FOR 1899.

W. W. STEVENS, *President.*

JOHN C. HAINES,
Vice-President.

HIRAM B. HOWLAND,
General Superintendent.

CHAS. F. KENNEDY,
Secretary.

J. W. LAGRANGE,
Treasurer.

Executive Committee.

MESSRS. JONES, LEVERING, NIBLACK, NOWLIN.

BOARD OF AGRICULTURE.

A TABLE SHOWING THE OFFICERS, PLACE AND PREMIUMS PAID OF EACH FAIR HELD BY THE STATE BOARD OF AGRICULTURE.

Year.	President.	Secretary.	Treasurer.	General Superintendent.	Place of Fair.	Premiums Paid.
1852.....	Gov. Joseph A. Wright	John B. Dillon.....	Royal Mayhew	W. T. Dennis	Indianapolis.....	
1853.....	Gov. Joseph A. Wright.....	John B. Dillon.....	Royal Mayhew	J. J. Bingham.....	Lafayette	
1854.....	Gov. Joseph A. Wright.....	Wm. T. Dennis.....	Royal Mayhew	W. T. Dennis.....	Madison	
1855.....	Gen. Joseph Orr.....	John B. Dillon.....	S. A. Buell.....	Calvin Fletcher, Jr.....	Indianapolis.....	\$2,753 00
1856.....	Dr. A. C. Stevenson	Ignatius Brown.....	S. A. Buell.....	Calvin Fletcher, Jr.....	Indianapolis.....	4,225 00
1857.....	Dr. A. C. Stevenson	Ignatius Brown.....	S. A. Buell.....	Calvin Fletcher, Jr.....	Indianapolis.....	4,127 00
1858.....	Dr. A. C. Stevenson	John B. Dillon.....	Thomas H. Sharp	Calvin Fletcher, Jr.....	Indianapolis.....	
1859.....	George D. Wagner	John B. Dillon.....	Thomas H. Sharp.....	James L. Bradley	New Albany.....	6,163 00
1860.....	George D. Wagner	Wm. T. Dennis.....	Thomas H. Sharp	James L. Bradley	Indianapolis.....	3,827 00
1861.....	D. P. Holloway.....	Wm. T. Dennis.....	H. A. Fletcher.....	.....	No Fair.....	
1862.....	James D. Williams.....	W. H. Loomis.....	H. A. Fletcher.....	J. A. Grosvenor	Indianapolis.....	3,994 00
1863.....	A. D. Hamrick	W. H. Loomis.....	H. A. Fletcher.....	J. A. Grosvenor	Indianapolis.....	
1864.....	Stearns Fisher	W. H. Loomis.....	Francis King.....	W. H. Loomis	Indianapolis.....	4,121 00
1865.....	Stearns Fisher	W. H. Loomis.....	Carlos Dickson	J. A. Grosvenor	Fort Wayne	4,078 00
1866.....	Stearns Fisher	W. H. Loomis.....	Carlos Dickson	J. A. Grosvenor	Indianapolis.....	
1867.....	A. D. Hamrick	A. J. Holmes.....	Carlos Dickson	J. B. Sullivan	Terre Haute	6,331 00
1868.....	A. D. Hamrick	A. J. Holmes.....	Carlos Dickson	J. B. Sullivan	Indianapolis.....	7,087 00
1869.....	A. D. Hamrick	A. J. Holmes.....	Carlos Dickson	J. B. Sullivan	Indianapolis.....	7,517 00
1870.....	J. D. Williams	Joseph Poole	Carlos Dickson	J. S. Benson	Indianapolis.....	7,914 00
1871.....	J. D. Williams	Joseph Poole	Carlos Dickson	Jacob Mutz.....	Indianapolis.....	8,564 00
1872.....	John Sutherland.....	Alex. Herron	Carlos Dickson	H. W. Caldwell.....	Indianapolis.....	9,619 20
1873.....	John Sutherland.....	Alex. Herron	Carlos Dickson	H. W. Caldwell.....	Indianapolis.....	8,864 75
1874.....	John Sutherland.....	Alex. Herron	Carlos Dickson	E. J. Howland.....	Indianapolis.....	10,754 00
1875.....	William Crim	Alex. Herron	Carlos Dickson	E. J. Howland.....	Indianapolis.....	12,068 20
1876.....	Hezekiah Caldwell.....	Alex. Herron	Carlos Dickson	J. L. Hanna	Indianapolis.....	8,179 30
1877.....	Jacob Mutz.....	Alex. Herron	Carlos Dickson	J. W. Furnas.....	Indianapolis.....	6,337 85
1878.....	W. B. Seward	Alex. Herron	Carlos Dickson	R. M. Lockhart.....	Indianapolis.....	5,057 00
1879.....	Robert Mitchell.....	Alex. Herron	Carlos Dickson	R. M. Lockhart	Indianapolis.....	5,472 00
1880.....	W. H. Ragan	Alex. Herron	J. A. Wildman	Fielding Beeler	Indianapolis.....	6,553 00
1881.....	R. M. Lockhart	Alex. Herron	J. A. Wildman	Fielding Beeler	Indianapolis.....	6,555 50
1882.....	H. C. Meredith	Alex. Herron	J. A. Wildman	Fielding Beeler	Indianapolis.....	8,098 00
	L. B. Custer					

1883.....	Robert Mitchell.....	Alex. Herron	J. A. Wildman	Fielding Beeler	Indianapolis.....	9,581 13
1884.....	Robert Mitchell.....	Alex. Herron	S. Johnson	Fielding Beeler	Indianapolis.....	10,414 30
1885.....	R. M. Lockhart ..	Alex. Herron	S. Johnson	Fielding Beeler	Indianapolis.....	9,000 50
1886.....	W. B. Seward ..	Alex. Herron	S. Johnson	H. B. Stout.....	Indianapolis.....	9,419 00
1887.....	W. B. Seward.....	Alex. Herron	S. Johnson	Chas. E. Merrifield.....	Indianapolis.....	9,726 50
1888.....	J. N. Davidson ..	Alex. Herron	S. Johnson	R. M. Lockhart	Indianapolis.....	9,917 50
1889.....	J. N. Davidson ..	Alex. Herron	S. Johnson	C. E. Merrifield	Indianapolis.....	10,200 00
1890.....	W. A. Banks	Alex. Herron	S. Johnson	C. E. Merrifield	Indianapolis.....	13,040 50
1891.....	W. A. Banks	Leon T. Bagley	S. Johnson	C. E. Merrifield	Indianapolis.....	15,297 00
1892.....	J. M. Boggs.....	Leon T. Bagley	S. Johnson	E. H. Peed	Indianapolis.....	19,876 00
1893.....	V. K. Officer.....	Chas. F. Kennedy	Jas. A. Wildman	E. H. Peed.....	Indianapolis.....	18,407 50
1894.....	J. M. Sankey	Chas. F. Kennedy	E. J. Robison	E. H. Peed.....	Indianapolis.....	18,516 70
1895.....	J. M. Sankey	Chas. F. Kennedy	E. J. Robison	E. H. Peed.....	Indianapolis.....	17,561 98
1896.....	W. W. Hamilton ..	Chas. F. Kennedy	E. J. Robison	E. H. Peed.....	Indianapolis.....	14,817 17
1897.....	C. B. Harris	Chas. F. Kennedy	E. J. Robison	E. H. Peed	Indianapolis.....	19,296 88
1898.....	Charles Downing.....	Chas. F. Kennedy	E. J. Robison	John L. Thompson	Indianapolis.....	11,113 32
1899.....	W. W. Stevens ..	Chas. F. Kennedy	J. W. Lagrange.....	H. B. Howland	Indianapolis.....	17,107 11
1900.....	Aaron Jones.....	Charles Downing.....	J. W. Lagrange	H. B. Howland	Indianapolis.....	

* Henry C. Meredith died July 5, 1882, and the Vice-President, L. B. Custer, served the unexpired term.

**LIST OF MEMBERS OF INDIANA STATE BOARD OF AGRICULTURE,
SHOWING DATE AND TERM OF SERVICE.**

NAME.	COUNTY.	FIRST ELECTED.	NO. YEARS SERVED.
Allen, Joseph	Montgomery	1853	2
Banks, W. A	Laporte	1882	12
Barnes, John P	Madison.	1879	4
Barnett, Cott.	Cass.	1898	3
Basler, F	Sullivan.	1872	2
Bennett, Wm. H	Union.	1854	7
Bennett, Wm. H	Union.	1863	2
Berry, W. W	Knox	1889	3
Blackstock, Wm. M	Tippecanoe	1895	2
Blanche, Willis	Howard	1887	2
Boggs, John M	Tippecanoe	1885	8
Bonner, W. H . . . . .	. . . . .	1859	2
Bradley, James L.	Johnson.	1856	3
Branham, D. C	Jefferson	1861	2
Brown, Dr. R. T	Montgomery.	1855	4
Brown, Geo. W	Shelby	1857	2
Burke, L. A	Posey	1870	5
Buskirk, Geo. A	Monroe	1870	2
Beauchamp, Wm. T	Vigo	1899	1
Caldwell, Hezekiah	Wabash	1867	12
Carr, John F.	Jackson	1862	2
Claypool, A. B	Fayette	1871	8
Claypool, M. S	Delaware	1893	7
Clemens, B. F	Wabash	1889	2
Cockrum, Jas. W	Gibson	1853	2
Coffin, W. G	Vermillion	1859	4
Cofield, J. W	Ohio	1877	4
Collins, T. H	Floyd	1858	4
Cotteral, W. W	Henry.	1883	2
Cox, E. T	Posey	1864	6
Crawford, George	Laporte	1862	2
Crim, Wm	Madison.	1869	9
Custer, L. B	Cass.	1878	10
Conger, Sid.	Shelby	1900	1
Davis, John L	Montgomery	1895	5
Davidson, Stephen	Fulton	1870	8
Davidson, Jasper N.	Montgomery	1888	12
Dennis, W. T.	Wayne	1854	5
Donaldson, W. C	Parke	1863	8
Dowling, Thos	Vigo	1871	4
Downing, Charles	Hancock	1893	8
Drake, James P.	Marion	1854	2
Dume, George G	Lawrence	1851	2
Duncan, Wm.	Lawrence	1858	4
Dungan, S. W	Johnson.	1882	12
Durham, Thcs	Vigo	1852	2

LIST OF MEMBERS, ETC.—Continued.

NAME.	COUNTY.	FIRST ELECTED.	NO. YEARS SERVED.
Emison, Samuel	Knox	1851	2
Fisher, Stearns	Wabash	1854	13
Fletcher, Calvin	Marion	1862	2
Franklin, W. M	Owen	1855	3
Freeman, A	Porter.	1858	4
Gaar, J. M.	Wayne	1865	2
Gerard, J. B	Dearborn	1873	2
Gilbert, Joseph	Vigo	1881	2
Graffe, Dr. G. B	Gibson	1855	5
Graham, John M.	Delaware	1883	4
Greer, W. A	Dearborn	1885	3
Grosvenor, J. A	Marion	1864	2
Haines, John C.	Lake	1896	4
Hamrick, A. D	Putnam	1859	14
Hamilton, W. W	Decatur	1891	6
Hancock, R. H	Harrison	1878	6
Hargrove, Samuel	Pike	1882	6
Harris, Chas. B	Elkhart	1892	6
Harris, Jacob R	Switzerland	1851	4
Hay, A. Y	Clark	1854	2
Haymond, Dr. Rufus	Franklin	1855	4
Haynes, R. P	Daviess	1875	8
Helm, Dr. Y. C	Delaware	1859	10
Herriot, Samuel	Johnson.	1853	2
Herron, Alex	Fayette	1867	4
Holton, W. B	Marion	1894	2
Holloway, David P	Wayne	1851	4
Holloway, David P	Wayne	1861	2
Holmes, D. J. C	Delaware	1859	10
Howland, H. B	Marion	1892	2
Howland, H. B	Marion	1896	3
Huffstetter, David	Orange	1853	2
Hussey, George	Vigo	1851	1
Johnson, F. C	Floyd	1872	6
Jones, Aaron	St. Joseph	1894	6
Jones, Dick	Bartholomew	1883	8
Jones, Lloyd	Huntington	1889	4
Kelley, John B.	Warrick.	1851	2
Kirkpatrick, T. M	Howard	1881	2
Lagrange, J. W.	Johnson.	1894	4
Lane, George W	Dearborn	1852	8
LaTourette, Henry	Fountain	1883	4
Levering, John	Tippecanoe	1852	2
Levering, Mortimer.	Tippecanoe	1897	4

LIST OF MEMBERS, ETC.—Continued.

NAME.	COUNTY.	FIRST ELECTED.	NO YEARS SERVED.
Lockhart, R. M	Dekalb	1874	20
Loder, Isaac B	Rush	1861	4
Loomis, W. H	Allen	1861	4
Matson, J. A	Putnam	1854	1
Matthews, Claude	Vermillion	1897	2
Maze, W. A	Tipton	1891	4
Meredith, Henry C	Wayne	1879	4
Milhouse, J. V	Jennings	1875	2
Mitchell, Robert	Gibson	1875	21
Mitchell, Thos. V	Rush	1869	10
Morgan, Jessie	Rush	1852	2
Mutz, Jacob	Shelby	1868	14
McBride, Jeremiah	Martin	1851	3
McClung, J. A	Fulton	1888	4
McConnell, George N	Steuben	1860	2
McConnell, George N	Steuben	1864	6
McCoy, James S	Knox	1892	4
McCrea, John	Monroe	1864	6
McDonald, M. A	Warren	1893	2
McDonald, James E.	Noble	1894	6
McMahan, John	Washington	1851	3
McWilliams, R. C	Parke	1881	2
Nelson, J. D. G	Allen	1853	6
Nelson, J. D. G	Allen	1870	4
Nelson, Thomas	Parke	1875	4
Nelson, Thomas	Parke	1889	2
Niblack, Mason J	Knox	1896	4
North, Benjamin	Ohio	1867	6
Nowlin, H. L.	Dearborn	1897	4
Officer, V. K	Jefferson	1888	9
O'Neal, J. K	Tippecanoe	1881	2
Orr, Joseph	Laporte	1851	6
Peck, Henry	Cass	1862	2
Peed, E. H	Henry	1885	8
Piatt, Nathan	Warrick	1860	4
Porter, Knobe	Wayne	1897	3
Poole, Joseph	Fountain	1861	12
Quick, S. R	Bartholemew	1879	4
Raab, D. G.	Ohio	1856	5
Ragan, W. H.	Putnam	1873	10
Ratliff, John	Grant	1883	4
Reese, D. E	Dearborn	1865	4
Reiter, Gerard	Knox	1888	1
Robison, E. A	Johnson	1898	3

LIST OF MEMBERS, ETC.—Continued.

NAME.	COUNTY.	FIRST ELECTED.	NO. YEARS SERVED.
Sample, H. P.	Tippecanoe	1873	8
Sankey, James M.	Vigo	1891	6
Shoemaker, John C.	Perry	1862	10
Seig, J. Q. A.	Harrison	1884	10
Seward, A.	Monroe	1851	2
Seward, W. B.	Monroe	1872	20
Seybold, Dempsey	Parke	1879	2
Simonton, Robert.	Huntington	1887	2
Smith, Abraham	Knox	1853	2
Spalding, T. N.	Lagrange	1852	2
Stevenson, Alex. C.	Putnam	1851	3
Stevenson, Alex. C.	Putnam	1855	4
Stevens, W. W.	Washington	1894	6
Stewart, Charles B.	Tippecanoe	1883	2
Sunman, T. W. W.	Ripley	1881	4
Sutherland, John.	Laporte	1864	18
Swinney, Thomas W.	Allen	1851	1
Thompson, John L.	Grant	1895	5
Thompson, S. H.	Jefferson	1864	3
Turner, John N.	Grant	1879	2
Tuttle, T. W.	Delaware	1876	1
Vawter, S.	Jennings	1855	3
Vinton, A. E.	Marion	1858	2
Wagner, G. D.	Warren	1854	7
Wiley, Lemuel	Switzerland	1863	1
Willard, Roland	Kosciusko	1851	2
Williams, James D.	Knox	1855	18
Wright, Joseph A.	Marion	1851	3

State Industrial Associations.

OFFICERS FOR 1900.

Indiana State Board of Agriculture—President, Aaron Jones, South Bend; Secretary, Charles Downing, Indianapolis.

Indiana Horticultural Association—President, C. M. Hobbs, Bridgeport; Secretary, James Troop, Lafayette.

Indiana Shorthorn Breeders' Association—President, E. Folsom, Indianapolis; Secretary, W. J. Quick, Brooklyn.

Indiana Dairymen's Association—President, J. J. W. Billingsly, Indianapolis; Secretary, H. E. Van Norman, Lafayette.

Indiana Wool Growers' Association—President, Sid. Conger, Flatrock; Secretary, J. W. Robe, Greencastle.

Indiana Swine Breeders' Association—President, J. B. Luyster, Franklin; Secretary, Allen Beeler, Liberty.

Indiana Poultry Breeders' Association—President, Frank Johnson, Howlands; Secretary, Jesse Tarkington, Indianapolis.

Indiana Farmers' Mutual Insurance Union—President, Aaron Jones, South Bend; Secretary, Joshua Strange, Marion.

Indiana Jersey Cattle Club—President, Dr. G. V. Woollen, Indianapolis; Secretary, W. S. Budd, Malott Park.

Indiana Corn Growers' Association—President, A. O. Lockridge, Greencastle; Secretary and Treasurer, H. F. McMahan, Fairfield.

Farmers' Institutes—Director, Prof. W. C. Latta, Purdue University, Lafayette.

Experiment Station—Director, Prof. C. S. Plumb, Purdue University, Lafayette.

State Chemist—Prof. H. A. Huston, Purdue University, Lafayette.

State Entomologist—Prof. James Troop, Purdue University, Lafayette.

THE Indiana State Board of Agriculture.

CONSTITUTION.

AS REVISED AND ADOPTED AT THE JANUARY MEETING OF THE BOARD, 1891.

ARTICLE 1. The name and style of this society shall be "The Indiana State Board of Agriculture," its objects, to promote and improve the condition of agriculture, horticulture, and the mechanic, manufacturing and household arts.

ART. 2. There shall be held in the city of Indianapolis, at such time as may be prescribed by law, an annual meeting of the State Board of Agriculture, together with presidents, or other delegates duly authorized, from each county, or such other agricultural society as may be authorized by law to send delegates, who shall, for the time being, be ex-officio members of the State Board of Agriculture, for the purpose of deliberation and consultation as to the wants, prospects and condition of the agricultural interests throughout the State; and at such annual meetings the several reports from county societies shall be delivered to the President of the State Board of Agriculture; and the said President and delegates shall, at this meeting, elect suitable persons to fill all vacancies in this Board: Provided, however, That said election shall not affect the members of the Board present, whose terms shall not be considered to expire until the last day of the session.

ART. 3. The State Board-elect shall meet immediately after the adjournment of the State Board, for the purpose of organization and for the transaction of such other business as the wants and interests of the society may require; and hold such other meetings from time to time, for making out premium lists, preparing for State Fairs, and all other business necessary to the promotion of the objects of the society.

ART. 4. The State Board-elect shall consist of sixteen members, chosen from the following districts:

- 1st District—Posey, Vanderburgh, Gibson, Warrick and Spencer counties.
- 2d District—Knox, Daviess, Martin, Pike, Dubois, Crawford and Perry counties.
- 3d District—Harrison, Washington, Orange, Floyd, Clark and Scott counties.
- 4th District—Jackson, Lawrence, Brown, Monroe, Greene, Owen, Johnson and Sullivan counties.
- 5th District—Jefferson, Switzerland, Ohio, Dearborn, Franklin, Ripley, and Jennings counties.
- 6th District—Bartholomew, Decatur, Rush, Fayette, Union and Wayne counties.
- 7th District—Madison, Hancock, Hamilton, Henry and Shelby counties.
- 8th District—Marion County.
- 9th District—Clay, Vigo, Parke, Vermillion and Fountain counties.
- 10th District—Putnam, Morgan, Hendricks, Montgomery and Boone counties.
- 11th District—Delaware, Randolph, Jay, Adams, Wells, Huntington and Blackford counties.
- 12th District—Carroll, White, Benton, Newton, Tippecanoe, Warren, Jasper and Pulaski counties.
- 13th District—Clinton, Tipton, Howard, Grant, Wabash and Whitley counties.
- 14th District—Elkhart, Kosciusko, Fulton, Cass and Miami counties.
- 15th District—St. Joseph, Marshall, Starke, Laporte, Porter and Lake counties.
- 16th District—Allen, Dekalb, Steuben, Lagrange and Noble counties.

Chosen for two years, one-half of whose terms expire every year, to wit: Those representing the first, second, third, fourth, seventh, fourteenth, fifteenth and sixteenth districts expire at the annual meeting of 1860, and those representing the fifth, sixth, eighth, ninth, tenth, eleventh, twelfth and thirteenth districts expire at the annual meeting to be held in January, 1861. To be chosen by ballot.

ART. 5. It shall be the duty of the President to preside at all meetings, conduct the business in an orderly and parliamentary manner, and officially sign all vouchers and drafts upon the Treasurer (except for premiums), and all other instruments requiring the same, and call special meetings in cases of emergency.

ART. 6. The State Board-elect shall, at the annual meeting after the adjournment of the delegate meeting, proceed to elect one of their number President, who shall hold his office for a term of one year, and until his successor is elected and qualified; and one of their number for Vice-

President, whose term shall be the same as President, who shall act, and for the time being have all the power, as President, whenever the President is absent from any regular meeting. They shall also elect some suitable person as Secretary and some suitable person as Treasurer, and a General Superintendent, who shall hold their offices each for one year, unless removed for incompetency or neglect of duty. They shall also elect four of their number who shall, with the President, constitute an Executive Committee, who shall have power to act in cases of emergency, where loss would result by waiting till a regular meeting of the Board, but shall have no power whatever during a meeting of the Board.

ART. 7. It shall be the duty of the Treasurer to safely keep the funds belonging to the society, pay out the same on orders or drafts drawn by the Secretary, and report annually to the State Board, and as much oftener as he may be called upon by the Board, and shall give bond for the faithful performance of his duties.

ART. 8. It shall be the duty of the General Superintendent to take care of and carefully keep all property belonging to the society, have the care and control of the Fair Grounds during the recess; have the supervision and oversight of such improvements or additions as may be directed by the State Board, and, under their direction, procure materials, contract for labor, and shall be, during the continuance of the Fair, the Chief Marshal and head of the police. The members of the Board shall employ all the necessary police and gatekeepers..

ART. 9. The Secretary shall keep a true record of the proceedings. He shall conduct all correspondence on behalf of the society, except when otherwise directed by the President. He shall, by himself and assistants by him appointed, arrange the details of the entries, tickets, and enroll the names of committees and judges of the State Fair, receive and record the various reports of the awarding committees, fill out and deliver all diplomas and certificates. It shall be the duty of the Secretary to condense the County Agricultural reports for each year into one volume and superintend the publishing of the same. He shall audit and file all accounts against the Board; draw orders in favor of the proper persons on the Treasurer for the amount; but orders shall not be drawn payable to order or bearer, but to the name of the party alone or his agent. He shall make an annual report, showing amount of all orders upon the treasury, and shall perform such other duties as the best interests of the society may demand; but he is at all times subject to the direction and control of the State Board.

ART. 10. At the annual meeting of the Board the salaries of the Treasurer, Secretary and Superintendent shall be fixed for the ensuing year: Provided, That said Board may, in their discretion, at any meeting of said Board, make said officers an additional allowance for extra services.

ART. 11. That no compensation shall be allowed to delegates attending the annual meetings of the State Board; nor shall the members of the State Board-elect be paid any sum of money, as compensation or otherwise, except by order of the Board-elect.

ART. 12. The State Board may adjourn from time to time, or they may be called together by the Secretary, by order of the President, by a written notice to each member, enclosed by mail, and a notice to such meeting published in two or more newspapers of general circulation, in the city of Indianapolis; and all meetings so held by adjournment, or calls, shall be deemed regular and legal.

ART. 13. Any alteration or amendment to this Constitution may be made at the annual meeting of the State Board, two-thirds of all the members voting for such amendment.

ART. 14. The following standing committees shall be appointed by the President, to whom all matters of business coming up for reference under their particular heads shall be referred, unless otherwise specially directed by the Board:

1. Finance and Claims.
2. Rules and Regulations.
3. Fair Grounds.
4. Unfinished Business.
5. Geological Survey—Executive Committee, ex-officio.
6. Premium List.

AMENDMENTS TO THE CONSTITUTION.

At the May meeting in 1851, certain rules, embracing ten sections, for the government of county agricultural societies, were adopted by the Board of Agriculture, as required in Section 1 of the statute laws enacted by the Legislature of Indiana for the "Encouragement of Agriculture," approved February 17, 1852.

At the February meeting of 1868 the rules were found inexpedient and were repealed, and the following resolutions, submitted by the Committee on Rules and Regulations, were adopted:

Resolved, That all county and district societies shall be organized and governed by the laws of the State of Indiana in regard to agricultural societies, and especially under the act passed by the Legislature and approved February 17, 1852.

Resolved, That all societies so organized will be entitled to send delegates to this Board (State Board of Agriculture) at its annual meetings, and will be received and acknowledged upon the presentation of their reports and credentials, and compliance with the laws as legally organized societies.

THE Indiana State Board of Agriculture.

A RESUME OF THE WORK FOR 1899.

REORGANIZATION OF THE BOARD.

JANUARY 4, 1899.

On motion of Mr. McDonald, Mr. Jones was made Chairman and Chas. F. Kennedy, Secretary of the Board for the purpose of reorganization.

The motion of Mr. Claypool that the Board proceed to the election of President prevailed.

The motion of Mr. McDonald that the election be by written ballot and that a majority of all votes be necessary to an election, prevailed.

ELECTION OF PRESIDENT OF THE BOARD.

First ballot for President.—Whole number of votes cast, sixteen, of which W. W. Stevens received nine and Charles Downing seven.

The Chairman thereupon declared Mr. Stevens duly elected President of Board for the ensuing year.

ELECTION OF VICE-PRESIDENT OF THE BOARD.

First ballot for Vice-President.—Whole number of votes cast, sixteen, of which John C. Haines received six, John L. Davis, three; Mason J. Niblack, two; Knobe Porter, one; Charles Downing, two, and James E. McDonald, two.

The Chair declared no election.

Second ballot for Vice-President.—Whole number of votes cast, sixteen, Mr. Haines receiving ten, Mr. Davis, two; Mr. Niblack, one; Mr. Downing, one, and Mr. McDonald, two.

The Chairman declared John C. Haines duly elected Vice-President of the Board for the ensuing year.

ELECTION OF SECRETARY OF THE BOARD.

First ballot for Secretary.—Whole number of votes cast, sixteen. Charles F. Kennedy receiving thirteen and Cott Barnett three.

The Chairman declared Charles F. Kennedy duly elected Secretary of the Board for the ensuing year.

ELECTION OF TREASURER.

First ballot for Treasurer.—Whole number of votes cast, sixteen. All of which were cast for J. W. Lagrange, and he was duly elected Treasurer of the Board for the ensuing year.

ELECTION OF GENERAL SUPERINTENDENT OF GROUNDS.

First ballot for Superintendent of Grounds.—Whole number of votes cast, sixteen. H. B. Howland receiving ten, H. L. Nowlin, four, and E. H. Reed, two.

The Chairman declared Mr. Howland duly elected General Superintendent of the Board for the ensuing year.

REPORT OF THE COMMITTEE OF THE WHOLE.

The motion of Mr. Niblack, that the President appoint the Executive Committee, prevailed.

The motion of Mr. Jones, that a committee of three be appointed to fix salaries for 1899, prevailed.

Committee—Messrs. Jones, Niblack and Davis.

Motion of Mr. Niblack, that the Board proceed to the selection of a member of the Indiana Live Stock Sanitary Commission to be recommended to the Governor for appointment, prevailed.

The motion of Mr. McDonald that inasmuch as there is but one candidate for this office, that Mr. George W. Hall, of Raleigh, by acclamation, to be appointed member of the Indiana Live Stock Sanitary Commission for the term of four years from the date of the expiration of his present term of office, prevailed.

REPORT OF COMMITTEE ON SALARIES.

Members, five dollars per day and five cents per mile for each mile traveled.

Secretary, \$1,800 per annum, he to pay help needed to conduct the work of his office.

Treasurer, \$550, he to pay ticket sellers and other help of his office.

Janitor, one dollar per day, including Sunday, free use of two gas fires and lights, free pasture for one cow, providing the cow shall not be turned loose, the right to raise chickens to not exceed 100, free garden spot to not exceed one-half acre.

General Superintendent, five dollars per day and five cents per mile for each mile traveled.

Judges, five dollars per day and actual mileage.

AARON JONES,
MASON J. NIBLACK,
JOHN L. DAVIS,
Committee.

The motion of Mr. Downing, that the Secretary be instructed to notify Mrs. Theresa Smith that the Board desire to renew the lease now held by them on real estate owned by her and to, if possible, obtain her consent to same, prevailed.

The motion of Mr. Jones, that the Board adjourn subject to the call of President, prevailed.

WARDER W. STEVENS, President.

CHARLES F. KENNEDY, Secretary.

Pursuant to the call of the President, the Indiana State Board of Agriculture convened in their rooms in the Capitol Building. All members of the Board present and W. W. Stevens presiding.

The minutes of the meetings up to and including the minutes of the annual meeting of January 4 and 5, 1899, were read and approved.

The motion of Mr. Downing, that the President and Secretary be authorized to make a new lease with Mrs. Theresa Smith for the use of the land owned by her and occupied by the Board, prevailed.

The motion of Mr. Nowlin, that a committee of three be appointed to present to the Board resolutions on the death of Hon. Jasper N. Davidson, of Montgomery County, prevailed.

Committee—Messrs. Nowlin, Claypool and McDonald.

On motion of M. S. Claypool, and seconded by H. B. Howland, of Howlands, Charles Downing, of Hancock County, was, by unanimous voice of the Board, recommended to the Governor for appointment as a member of the Board of Trustees of Purdue University to succeed Hon. John Martin, of Franklin County, whose term expires July 1, 1899, and the Secretary was ordered to certify the action of the Board to the Governor.

The motion of Mr. Niblack, that Mr. Levering, as Superintendent of the Dairy Products for the Fair of 1898, be reimbursed in the sum of eighteen dollars and four cents on account of money paid out to exhibitors in excess of receipts for the butter and cheese left in his care, prevailed.

The motion of Mr. McDonald, that the Board go into the Committee of the Whole on the revision of the premium list, with Hon. Aaron Jones as Chairman, prevailed, and Mr. Jones assumed the direction of the committee.

The Chairman of the committee reported the revision of the premium list completed, and moved the adoption of the report of the committee and the discharge of the committee, which motion prevailed.

The motion of Mr. Downing, that the Executive Committee submit sample of paper and specification for the furnishing same, prevailed.

The motion of Mr. Barnett, that the south wing of the poultry building be equipped with coops, prevailed.

The motion of Mr. McDonald, that the Board proceed to elect a janitor to succeed Mr. Brown and that the election be by ballot, prevailed.

Result of ballot.—Whole number of votes cast, sixteen; necessary to a choice, nine, of which Mr. D. M. Brown received thirteen and Mr. W. H. Stearn, three. The President declared Mr. Brown elected for the year 1899.

The claim of W. S. Budd for loss on exclusive ice privilege was presented, and on motion of Mr. Niblack the claim was rejected by unanimous vote of the Board.

The motion of Mr. Claypool, that all unfinished business be referred to the Executive Committee, prevailed.

Board adjourned subject to the call of the President.

WARDER W. STEVENS,
President.

CHAS. F. KENNEDY,
Secretary.

MEETING OF THE EXECUTIVE COMMITTEE, APRIL 25.

Pursuant to call of President Stevens, the Executive Committee of the Board convened in the office of the Secretary, all members present.

The following bids for printing and furnishing the premium list for 1899, bids based on twelve thousand copies, with sixty-four pages each, and to conform to samples of cover and inside pages as furnished to bidders by the Secretary of the Board.

		Additional Pages.
Levy Bros. (per page).....	\$4 00	
Indiana Newspaper Union.....	221 00	\$3 00
Banner Publishing Company.....	198 00	3 50
William B. Burford.....	197 50	3 75
Sentinel Printing Company.....	254 50	
Journal Job Printing Company.....	270 00	

The motion of Mr. Niblack, that contract for printing Premium List be awarded to W. B. Burford, prevailed.

The motion of Mr. Niblack, that the Board authorize the Secretary to accept the design for the new cover, prevailed.

The motion of Mr. Jones, that the Board authorize the Secretary to have the typewriter repaired at a cost of twelve dollars, prevailed.

The motion of Mr. Levering, that the President build a lecture pavilion 40 feet by 60 feet and locate same between the Administration Building and Art Hall, prevailed.

The motion of Mr. Jones, that the Agricultural Hall and front of Administration Building be painted, prevailed.

The motion of Mr. Niblack, that all repairs and improvements proceed under the direction of the President, prevailed.

Claims numbering 3147 to 3163, inclusive, as shown on docket "A," were approved.

WARDER W. STEVENS,
President.

CHAS. F. KENNEDY,
Secretary.

MEETING OF THE EXECUTIVE COMMITTEE, AUGUST 3.

Pursuant to the call of the President, Mr. Stevens, the Executive Board of the Indiana State Board of Agriculture convened in the office of the Secretary, August 3, 1899, all members present except Mr. Jones.

The motion of Mr. Nowlin, that the President be instructed to employ city police for service on the grounds during the fair, prevailed.

The motion of Mr. Levering, that the complimentaries be issued by the Secretary under the direction of the President, prevailed.

The motion of Mr. Nowlin, that the Secretary be instructed to employ a special advertising agent to work the small towns along the railways near the city, prevailed.

The motion of Mr. Niblack, that Mr. Bingham be employed as press representative for the Board to serve in connection with the Indianapolis papers, prevailed.

The motion of Mr. Levering, that the advertising be limited to the press and bill boards and that the Secretary be instructed to decline to use other mediums, prevailed.

The motion of Mr. Niblack, that Mr. Levering be made a special committee to negotiate a loan at not to exceed 4 per cent. to purchase that part of the Fair Grounds owned by Mrs. Theresa Smith, prevailed.

The motion of Mr. Niblack, that the Secretary communicate with Sousa's Band and contract for two concerts during the fair at a cost not to exceed \$2,500, prevailed.

Claims numbering 3164 to 3197, inclusive, as shown on claim docket "A," were approved.

WARDER W. STEVENS,
President.

CHAS. F. KENNEDY,
Secretary.

MEETING OF THE STATE BOARD, SEPTEMBER 22.

Pursuant to the call of the President, the members of the Indiana State Board of Agriculture convened in the assembly room in the Administration Building State Fair Grounds. All members present.

The motion of Mr. Claypool, that the Secretary be instructed to draw warrants on the Treasurer for the payment of all premiums and expenses of the fair, prevailed.

The protest of Mrs. Geo. Coughlin was read, and the time having expired for the consideration of such protest and the party filing the same failing to present evidence to sustain her claim, the motion that the Board sustain the ruling of the superintendent of the department prevailed.

WARDER W. STEVENS,
President.

CHAS. F. KENNEDY,
Secretary.

MEETING OF THE EXECUTIVE COMMITTEE, OCTOBER 18.

Pursuant to the call of the President, the Executive Board of the Indiana State Board of Agriculture convened at the office of the Secretary, October 18, 1899, all members present.

The Secretary read claims numbers 3202 to 3337 as shown by claim docket "A," and claims numbers 3338 to 3377, as shown by claim docket "B," and the same were approved.

The motion of Mr. Nowlin, that the matter of program for the annual meeting be referred to a committee composed of the President and Secretary, prevailed.

The motion of Mr. Niblack, that the Secretary be instructed to supply Senator Fairbanks and Congressman Overstreet with data necessary to perfect the claim of the Board against the Federal Government for damage to the grounds and buildings, prevailed.

WARDER W. STEVENS,
President.

CHAS. F. KENNEDY,
Secretary.

ANNUAL MEETING OF THE DELEGATE BOARD.

As provided by law the Delegate State Board of Agriculture convened in Room 12, Capitol Building, at 10 o'clock a. m., January 2, 1900, W. W. Stevens presiding and all members of the State Board present.

Hon. Thomas Taggart, Mayor of Indianapolis, was introduced and proceeded to welcome the delegates to the city.

Mr. President, Members of the Indiana Agricultural Association:

I desire this almost New Year's morning to congratulate you upon the last State Fair that was held in this city. I doubt if Indiana ever had a State Fair equal to the one held under the auspices of this Board last year. I felt that it was a credit to the State Board, to the city of Indianapolis and to the State of Indiana to have such an exhibit brought to the capital city. I believe this year the State Board, when it is organized, should do as other people do, make good resolutions for the coming year, and one resolution should be that the coming State Fair shall excel the last.

I doubt if any other State has advanced as rapidly as Indiana has in the last few years in making progress in the way of giving an exhibit of things pertaining to the progress of the State. You will find in the present State Board men of every calling and every avocation of life; and I think the tendency is growing to have not only farmers on the State Board. It is not necessary for a man to be a farmer to be a good member of the State Board of Agriculture; but you can take men from every walk of life, the lawyer, the doctor, the merchant, and they will all represent your interests. I think it takes men of different characters to make a good State Board. You get better ideas from this kind of a Board than if they were all of one occupation.

I think the city of Indianapolis fully appreciates the State Board, and I should like to see a closer relation between the Board and the city—more work for Indianapolis in conjunction with the State Board to help make the State Fair a success.

I hope that the coming year will be a prosperous one for the State Board, even more prosperous than the last has been.

The Vice-President, John C. Haines, was called to the chair and the President read his address to the Delegate Board, which was in words and figures as follows:

PRESIDENT'S ADDRESS.

To the Members of the State Board of Agriculture: While we stand to-day upon the threshold of a new year—that is full of hope and bright promise—sentiment reminds us of the fact that we are in the midst of the struggles of a dying century; and what a century, marked as it has been with wonderful occurrences and extraordinary development of our resources and our people.

Within this closing century great changes have been wrought. A howling wilderness has given way to a civilization versed in all the arts and sciences. The hunting grounds of savage life have developed into cultured fields and verdant pastures. Where roamed the buffalo and the antlered tribes, domestic flocks and herds now quietly feed. The wigwam and rude villages of the forest warriors have given place to beautiful towns and cities. Even near the spot where we are now gathered there stood within the past century the council house of the red man, and his light bark canoe plied up and down the many streams that drain the picturesque hills and fertile valleys of our commonwealth. Of all his former might and glory a rude mound of earth here and there are the only works of art left to perpetuate his memory.

As the morning mists vanish before the summer's sun, so have the wildness and conditions of savagery of a hundred years ago given way to the mighty crafts of civilization. And may we add that the sturdy pioneer and honest tiller of the soil has been the most potent factor in bringing about this wonderful revolution.

OBJECT OF MEETING.

Under an organization based upon a law of the State framed almost half a century ago, you have come together in annual session "for the purpose of deliberation and consultation, as to the wants, prospects and condition of the agricultural interest throughout the State."

It is certainly very pleasant for persons having a common object and a common interest in view to meet together and exchange social salutations at regular intervals, and to consult with regard to the best manner of promoting that common object and interest.

Those engaged in professional, mercantile and mechanical occupations have associations for mutual improvement, and shall the interests of the farmer, which are of so much importance in themselves, and of so much importance to all other interests, be unworthy of associated effort.

Association is the origin and impulse of all progress. The elements of every department of society have their expansion and maturity under the vital power of this great principle. When its object is the good of all it

is to be commended. There is no class that would be more benefited by organization than farmers, and certainly no injury would result to any other class of people by it.

ALL ARE INTERESTED.

While farm organizations are in the main intended to better the condition of the agriculturist, it would be a gross error to suppose for a moment that no other class of people are interested in such means as may be adopted to advance agricultural prosperity.

The fact is, every human being who eats bread or wears clothes has a direct interest in the results of the tillage of the soil, and in farm economy in general. The civilization of man has ever gone hand in hand with his knowledge of agriculture.

It is only a question of time when the neglect of agriculture by any nation or people will result in their downfall and ruin.

Rome and Athens fell because their rulers aimed to maintain their greatness and power by building up and adorning cities to the neglect of agriculture.

Tribes of men may exist in sparsely settled countries without tilling the earth, but vast cities can not rise nor subsist, nor immense armies be maintained, nor vast conquests made in lands where agriculture is not recognized as the first and greatest of all industries.

If national greatness or independence—if contentment at home and dignity abroad—is most easily and certainly maintained by encouraging and cultivating in a proportion commensurate with its importance to the commonwealth in which we live, the science of agriculture, surely there is not a citizen of our State that would not rejoice with us on this occasion for the general welfare of the whole people.

ENCOURAGING ORGANIZATION.

In the discharge of that part of your duty imposed by the law, and which requires you to look after the wants of the farmer, we believe that the first great want is organization, and this you should encourage in every possible way. Not only should you strive to have a fair in every county in the State, but other organizations as well—any association, in fact, that looks to the betterment of the farmer's condition socially, morally or financially.

But more particularly should your efforts be directed to the establishment and improvement of the county and district fairs. A session of this meeting has been set apart for a general discussion of this subject, and we expect good results to follow from it. The fair associates together different classes of people for the purpose of comparing the experiences and

wisdom of each, for the benefit of all. It renders available to the public whatever improvements have been made in agriculture or its allied industries, and thus tends to the more rapid development of wealth and the progressive advancement of society.

Fairs direct the attention of all classes to the most useful and important pursuits of life, and thus throw out the most healthful and beneficial influences.

We regret that every county in the State is not duly represented at our annual meetings. In view of the fact that the representation is growing gradually less year by year, on account of the decadence of local fair organizations, something should be done, if possible, by this Delegate Board, to create a new interest in county and district fairs.

And if possible every agriculturist in the State should be made to feel that he has a direct personal interest in State Board matters and the success of the State Fair.

• INCREASE ITS USEFULNESS.

How this Board can enlarge its sphere of usefulness and carry out the full intent and meaning of the law under which it exists, is a matter that deserves your serious consideration. As at present operated the State Board of Agriculture does little more than hold a fair one week each year, the remainder of the time being devoted to the publication of a report of its proceedings, and preparing for another show. The fair is a great educator, as far as it goes, providing as it does for a display of farm products, mechanics and the arts, but in addition to this a great educational work might be carried on.

We have it in our power to disseminate a great deal of useful knowledge among farmers, if we would only adopt some systematic mode of procedure. With some additional labor on the part of the Secretary, but without any extra expense to the Board, our annual reports might be enlarged and made more valuable by handling some important topic pertaining to agriculture, in a thorough, scientific manner, getting out the best thought and ripest experiences of experts on said subject, a plan similar to that which is being carried out in some of the neighboring States.

Some one has suggested that our State Board of Agriculture should be reorganized, or remodeled, on much the same method as is the Agricultural Department at Washington, combining in one general head and under one general management all the interests in the State that have for their object the advancement of the cause of agriculture.

Another suggests that in order that all the people of the State may be properly represented on the State Board of Agriculture, the members of the Board should be elected by the people of the several districts.

We do not care to discuss the advisability of adopting these suggestions, but they may be considered as pointers, showing the necessity for

this Board to broaden its work, and be more generally useful to that class of people who look to it for much that is necessary to advance and keep our agricultural interests to the fore.

MOST SUCCESSFUL FAIR.

The manner in which the State Fair has been conducted the past few years has met with very general approval among the people of the State. They now look upon it as an institution of learning by means of object teaching—an institution that each succeeding year presents new objects, breathes new life and diffuses new ideas that go out to aid all classes in the improvement of their industries and the enjoyment of life.

So long as we continue to make it attractive to the masses—that is to say, while we preserve the prominent characteristics of an agricultural display, taking on less of the exposition character, in which trade and manufacture predominate—so long will it be liberally patronized by our people and be a financial success. Indiana has developed greatly in manufactures in recent years, it is true, but still she is an agricultural State, and her interests along that line should be carefully ministered to by the State Fair management. Their efforts in this direction the past season were highly appreciated, as is evidenced by the fact that the Fair of 1899 will go down as the most successful exhibition of its kind ever held in the State—all things considered.

From our visitors during the Fair were heard frequent expressions of praise and approval. Since the Fair, compliments innumerable have been received, as every member of the Board will bear witness.

One who has visited the Fair for the past forty-four years speaks as follows through the columns of the Indiana Farmer:

"The State Fair is over, and its lessons have been taught. The farmer who failed to attend missed very much which was in those lessons. Such a fair as Indiana had this year was a great credit to the State. I have attended nearly every State Fair since 1856, and can truthfully say that in point of merit, in all of the departments, unless it be horticulture, such a display was never before made at any fair I have attended in Indiana."

The following is a clipping from a very prominent agricultural paper outside the State:

"In almost every department the Indiana Fair of 1899 broke all existing records, and in some directions the mark was placed so high that the management in the future may have difficulty in living up to this year's achievements. In general management, quantity and quality of exhibits, special features and entertainments the meeting was an unqualified success, and the attendance in spite of some cold, cloudy days was of a character to gratify the officials in charge."

A comparison of the legitimate receipts of fairs for the past ten years, and premiums paid, together with surplus remaining to be applied on necessary improvements and running expenses, may be of interest in this connection. These legitimate receipts do not include borrowed funds or appropriations from the State.

	Legitimate Receipts.	Premiums Paid.	Surplus for Running Expenses.
1890	\$22,740 41	\$13,040 50	\$9,699 91
1891	30,473 93	15,297 00	15,176 93
1892	28,133 74	19,875 50	8,358 24
1893	13,170 71	17,768 00	—4,597 29
1894	31,597 05	18,516 70	13,080 35
1895	27,124 61	17,555 48	9,569 13
1896	19,644 73	14,817 17	4,828 24
1897	39,720 75	19,296 93	20,423 82
1898	25,288 50	11,113 42	14,175 08
1899	39,079 95	17,107 11	21,972 84

LACK OF EARNEST CO-OPERATION.

Effort was made to induce the city of Indianapolis to take part in some sort of street pageant, flower carnival, or a least give a half holiday to help the Fair along, but all to no avail. Whether the business men of Indianapolis are gaining more in the long run than they are losing by their indifference to the success of the Fair is an open question with a great many people.

The only suggestions we offer is that such a thing is possible that the goose that lays the golden egg can be killed by neglect.

But we are glad to say that every merchant in the city had a good word for the Fair because it brought them money. We have this evidence from their own lips.

"All the clothing houses, the When, the Globe, the Model, the Eagle, the Arcade, the Progress, said the week had been in every way a success.

Geo. W. Bliss said: "The best State Fair week we have ever had since we have been in business. Don't like to say any thing about prosperity, but during this week it appears to have been here with both feet. I never saw people with as much money and who were so easily separated from it. We sold twice as many dollars' worth of goods on Wednesday and Thursday of this week as during any previous entire week of the Fair."

The Parrott-Taggart bakery, the Hitz bakery, and Bryce's bakery, all reported that the State Fair, in connection with the cooler weather, had stimulated the demand for their products.

Henry Kahn: "The business of this tailoring company during the State Fair week has been 75 per cent. greater in the number of orders booked than in the corresponding week of 1898."

Paul Krauss: "Out trade in men's furnishings moved up greatly during Fair week. Many visitors from outside the city found us and left money with us."

L. S. Ayres & Co.: "We have had an excellent week's business. Our sales have been largely from better grades of goods than usually characterizes the Fair week trade. We are pleased to note that the big end of our trade this week has been from transient buyers."

Leopold Strauss: "We have had an excellent trade; the best we have ever had at this season."

George Gay: "The trade of the New York Store is the best we have ever had during the week of the State Fair. All the conditions were favorable to bring people to the Fair and to bring them in the humor of buying. It has been a wonderful week, considering the season, in every department of our store. The out-of-town people were here."

The Bowen-Merrill Co.: "The State Fair has helped us more this year than any previous year. The half-rate on the railroads was taken advantage of, and brought in the buyers. This is not the season at which we sell high-priced goods, but the visitors to the Fair were ready purchasers of many articles which they bought as souvenirs to take home."

H. P. Wasson: "The best fair week we ever had. Not only were Wednesday and Thursday good, but Friday was by more than double the best fair-week Friday we ever knew. Judging from appearances and from what the people say, this State Fair has been more satisfactory than any of its predecessors. We can not help speaking approvingly of the managers of the Fair. They have given suitable attractions and the people have shown that when the Fair is put on a high plane, they will patronize it. Sousa's band was a great drawing card."

Similar testimonials might be produced by scores of others; but with this before us we can not help but feel that the merchants of Indianapolis ought to do more for us than they have been doing. We would suggest that it would be to their interests to erect upon our grounds a commodious exposition hall, where a suitable display of their wares could be made, thus adding to the permanent attractions of the Fair and assisting very materially in making it a financial success.

THE PRESS.

We desire it to go on record that the press of Indianapolis gave us earnest, faithful service during the last Fair, without a single exception. No adverse criticisms of the management were made, and no attacks or innuendoes were indulged in, calculated to bring disrepute or embarrassment upon the Association.

Friendly criticisms or timely suggestions are always in order and no one objects to them, but to be reprimanded and made fun of, as has been done on some former occasions, does great injury to a fair, and no one is

benefited thereby. To the press throughout the State we feel under lasting obligations, as they gave much of their valuable space to such reading notices as were sent out from time to time, and did it willingly, and without hope of pecuniary reward, having only in view the best interests and success of the State Fair. In short, the press of the State seemed to vie with the management in their efforts to win out, and we shall hold them ever in grateful remembrance therefor.

SOME SUGGESTIONS.

1st. The experiment of fitting up a commodious auditorium and having popular lectures delivered therein during the week of the Fair was very satisfactory and met with the hearty endorsement and approval of hosts of our visitors. This feature should be continued and improved upon.

2d. Additional space should be provided for the display of agricultural implements and machinery, so that all who come may be satisfactorily accommodated, and the liberal policy we have adopted with this very large class of exhibitors in the past should be continued.

3d. The field test of farm machinery proved to be a very interesting feature of our last Fair and should be continued. We believe also that farmers should be encouraged to vie with each other in doing some of the different kinds of farm labor, to the end that the science of agriculture may become one of the fine arts.

4th. Parties or associations that desire to secure the Fair grounds for picnics or public demonstrations of any kind should be required to pay reasonable compensation for the use of same, sufficient at least to cover expense of putting things in shape again, and making good all damages sustained.

5th. The claim against the government for damages sustained to Fair Grounds, while soldiers were encamped thereon, amounting to \$8,220.50, has been placed in the hands of our Representative in Congress, and we have the assurance that said claim will be paid at the earliest possible moment for Congress to give it consideration.

6th. I would suggest that a committee be appointed by this Board to draft a suitable memorial to be presented to the next General Assembly, setting forth the necessity of the State's purchasing that portion of the Fair Grounds which we now hold by virtue of lease, the annual rental amounting to \$2,412, and thus put the Association upon a more substantial footing. The farmers of Indiana have asked but little of the State, but when we come to the capital demanding recognition we are charged with asking for class legislation or begging for funds to carry out our projects. The farmer, a beggar! It is a shame to put such an imputation on his name. The man owning broad and fertile acres, well filled barns, with flocks and herds dotting hillsides and valleys, and passing his life in God's

pure air and gladdening sunshine, never begs. Has the State a greater benefactor? Does he not contribute more largely than any other class of people to many things from which he derives no personal benefit? Witness the high salaries of officials, but he never gets office; his money aids in maintaining hospitals, but he pays his own doctor bill; he is taxed to support the laws, but he seldom breaks one; his money aids in maintaining the peace, but he is a stranger at the bar of the criminal court; he contributes to the almshouse, but he never asks charity; the jail makes a demand for his money, but he is never behind the bars; the workhouse says, Give to me, which he does, but proudly works for himself on his own land; he pays a tax to the house of refuge, but his own children are law-abiding and filial; his presence never helped to fill the penitentiary or reformatory, although he is taxed to maintain them. In short, the farmer is the last man to beg.

He simply asks, and properly so, too, that a small part of the money he pays into the general treasury for the good of the whole commonwealth, shall be expended to advance the general interest of agriculture, and thereby aid all other industrial interests of the State.

7th. Gentlemen, a very important duty devolving upon you is the selection of suitable persons to fill eight vacancies on the State Board. The personnel of this Board is just what you make it. If you desire to have a Board that is in fact as well as in name an agricultural institution, coming together "for the purpose of deliberation and consultation, as to the wants, prospects and conditions of the agricultural interests throughout the State," as the law requires, then select representative men who are in sympathy with these interests and who know what the wants of this great body of our people are.

I will not detain you longer, I hope that all your discussions and all that is done here at this congress of industrial associations, may be of such character that when this series of meetings come to a close you may feel that you have contributed very materially to the advancement of agriculture in the State.

I must say that my connection with the Board in an official capacity for the past year has been very pleasant, and I take this opportunity to thank the officers and members of this Board for their uniform kindness and courtesy, as well as the effort put forth by each and all to make the Fair of 1899 such a complete success. My only regret is that it has not been in my power to render more valuable service for the kindness received at your hands.

The motion, that a committee be appointed to report on the recommendations of the President's address, prevailed, and Vice-President Haines appointed the following committee—Aaron Jones, Robt. Mitchell, Newton Brown, Mortimer Levering, Jesse Stevens.

President Stevens announced the following committee on credentials: H. L. Nowlin, John Tilson, Calvin Sturdevant.

Auditing Committee—Aaron Jones, John L. Davis, John L. Thompson.

To Receive the Governor—James E. McDonald, H. C. Hobbs, William Blackstock.

The committee who had been appointed to wait on the Governor reported at this time that the Governor was ready to speak to the Board.

GOVERNOR'S ADDRESS:

Governor Mount was introduced and addressed the meeting at some length on the relation of the State Board of Agriculture to the State of Indiana.*

SECRETARY'S REPORT.

Since I have been Secretary of the Board I have religiously avoided making any other statement than the financial statement of my report. I feel warranted this morning in saying a few things, for you will understand the attitude in which I am placed at this time. In making this, my last report, if I should say to you that I do this without any feeling of regret, I would be very ungrateful indeed to the gentlemen who represent the State Board of Agriculture, the members of the Board with whom I have been associated, as well as false to myself. The fact that my old friend, Mr. Heron, who was Secretary of this Board for so many years, comes to see me often makes me feel that there will come days when I shall regret having taken this step. It has been extremely pleasant to me to be Secretary to this Board, and I shall always be glad to remember by associates. I can say truthfully that I have at this moment feelings of regret at having resolved to retire from this position. Business conditions and affairs have caused me to take this step, and I hope I have not made a mistake in doing so. The future will determine this.

*The stenographer, under the impression that the Governor's address was in manuscript, failed to take the same, and the Governor could not find time to reproduce it for this report.—Secretary.

When I came on the Board in 1893, the World's Fair year, the year when the National Encampment of the Grand Army of the Republic was held here, depression in every branch of industry came to this country. I therefore feel that the State Board of Agriculture throughout the last seven years is entitled to consider that they are to be congratulated in being able to maintain the business at a profit, or at least keep the books even. When I say that the resources of the Board available for all expenses are at this time \$6,000 above all of their liabilities, and when I say that the property of this Board is estimated at \$165,000, you will feel that you have something tangible in your possession.

I have ever had to fight the opinion that this State Board was a private corporation, that this property was managed, controlled and to be used by private individuals. I wish to state so that every man who pays taxes may know that every single dollar of this property belongs to them; that it belongs to the State, and never costs the State a penny. They can not convert it to their own use, and can not convert it to any use except to give a State Fair and manage the business of the Board. When they have done that it goes back to the State of Indiana, from whence it never came. This property has come largely by the enhancement of property once in possession of the Board, viz., Morton Place.

I am truly grateful that in retiring as its Secretary I can look forward to a future for the State Board which I have every reason to believe will be prosperous and successful. It is true that the standard fixed by the last State Fair is a high one, and it is a pleasure to me to think now that the State Fair of Indiana was placed this year on such a plane. It has had to confront all kinds of opinions; it was before the public to be criticized, but not one word, so far as I have heard, of unfavorable criticism has been made against its management. It was clean, wholesome and successful; it was an educational institute of a high character. I believe the money spent for fairs is the best money spent for education in any way or any place. Therefore, I wish you to follow the President's recommendations closely. I think they are very valuable and should be followed.

I thank you for the courtesy. I thank the State Board of Agriculture, and I thank everybody with whom I have come in contact in performing the duties of Secretary, exhibitors and patrons, since I have been Secretary of the State Board of Agriculture of Indiana.

FINANCIAL STATEMENT.

Receipts.

Balance on hand.....	\$4,038 77
Appropriations	1,000 00
Rent of grounds	175 00
Rent of track and stalls.....	188 35
Privileges	3,020 65

Stall fees	1,207 00
Entry fees	3,435 00
Exhibitors' tickets	526 00
Special admissions	726 80
Admissions	30,164 50
Hay	70 00
Rent of Lamps	35 00
Loan State Bank of Indiana.....	1,978 60
Loan Franklin National Bank.....	977 63

\$56,543 30

Disbursements.

Per diem and mileage.....	\$2,680 15
Salaries	2,715 00
Construction	834 09
Repairs	6,305 71
Furniture and tools.....	82 20
Insurance and rental.....	2,852 10
Banking and interest.....	1,000 00
Postage, telegraph and telephone.....	428 72
Express and freight.....	270 72
Printing, stationery and supplies.....	1,368 96
Advertising	3,211 89
Judges	736 10
Police	531 20
Assistant Superintendent	1,498 50
Supplies for Fair.....	1,054 32
Claims for past year.....	143 04
Music	3,259 50
Lecture	10 00
Receipts for admission redeemed.....	94 50
Miscellaneous	538 99
Premiums	17,107 11
Amount to balance.....	730 50

56,543 30

STATEMENT OF FAIR.

Receipts.

Privileges	\$3,020 65
Stall fees	1,207 00
Entry fees	3,435 00
Exhibitors' tickets	526 00

Special admissions	726 80
General admissions, Sept. 19.....	728 00
General admission, 50 cents, Sept. 20.....	4,268 00
General admission, 25 cents, day, Sept. 20.....	192 50
Grand Stand, 25 cents, day, Sept. 20.....	422 50
General admission, 25 cents, night, Sept. 20.....	780 75
Grand Stand, 25 cents, night, Sept. 20.....	1,054 50
General admission, 50 cents, day, Sept. 21.....	13,843 00
General admission, 25 cents, day, Sept. 21.....	292 00
Grand Stand, 25 cents, day, Sept. 21.....	1,508 25
General admission, 25 cents, night, Sept. 21.....	1,133 00
Grand Stand, 25 cents, night, Sept. 21.....	1,334 75
General admission, 50 cents, night, Sept. 22.....	3,911 50
General admission, 25 cents, night, Sept. 22.....	65 25
Grand Stand, 25 cents, night, Sept. 22.....	630 50

\$39,079 95

Disbursements.

Premiums, speed	\$5,940 00
Premiums, horses	1,903 00
Premiums, cattle	2,974 00
Premiums, sheep	1,098 00
Premiums, swine	1,426 00
Premiums, poultry	776 00
Premiums, fruits	397 50
Premiums, flowers	345 00
Premiums, bees and honey.....	124 00
Premiums, dairy products.....	251 11
Premiums, agriculture	520 00
Premiums, arts	1,352 50
Per diem and mileage	2,680 15
Salaries	2,715 00
Postage, telegraph and telephone.....	428 72
Printing, stationery and supplies.....	1,368 96
Advertising	3,211 89
Judges	736 10
Police	531 20
Assistant Superintendents	1,498 50
Supplies for Fair.....	1,054 32
Music	3,259 50
Lecture	100 00
Admission receipts redeemed.....	94 50
Press agent	50 00

Special premiums for cattle.....	75 00
Drilling chorus	105 00
Profit of Fair	4,004 00

\$39,079 85

CHARLES F. KENNEDY,

Secretary.

REPORT OF GENERAL SUPERINTENDENT OF GROUNDS.

To the President and Delegate State Board of Agriculture:

The undersigned reports, as General Superintendent, few if any changes will be required the following year, as all former suggestions were carried out as nearly as possible to the letter, and the grounds and buildings could be put in order for a fair in a short time, as everything has been cleaned up and put away, and a careful inventory is filed herewith of articles and appurtenances belonging to the State Board of Agriculture.

When the grounds were received by me they were in a deplorable condition, due to the occupancy of the United States soldiers, who did not leave the grounds till the first day of November. Unless one saw the vast amount of rubbish and destruction wrought by them they could not realize the extent of the damages. In some buildings there was not a stall or pen left to tell the story of the original design, all having been burned up for fuel. Many of the buildings have been on fire; all had been seriously damaged or defaced. The grounds were a series of sinks, ditches and stakes; grass and trees were destroyed. It was necessary in many places to harrow the ground and resow. As proof of this condition I will file a report of a committee that was appointed. This committee, after a careful investigation, made an itemized, detailed account, amounting to \$9,037.50, of which the State paid \$817 for the time it was occupied by the National Guard and before they became federal troops, leaving a just claim against the government of \$8,220.50, which has been placed in the proper hands for collection, and I trust here that every member of this Delegate Board will render his assistance, through the proper channel, to recover the amount due as early as possible, as it caused the State Board considerable embarrassment, making it necessary for them to borrow money in order to repair damages done by others, most of which seemed entirely unnecessary, in order to be ready for the next State Fair. All this work was done as cheaply as possible, and I wish to express by gratitude to the different labor unions who permitted me to get the work done as cheaply as possible, the labor necessary to repair the buildings. There was very little new work done on the grounds this year, as, under the circumstances, we did not feel that we could afford it. We, however, seemed to have the sympathy of the people and certainly received their hearty endorsement. One of the old grandstands

was moved and fitted up as a valuable addition to the dairy building, which was an absolute necessity in order to accommodate the visitors who were anxious to see and learn. We found it necessary to convert the waste space in the Art Building into a lecture room and purchase sufficient chairs to furnish it. All this proved eminently satisfactory. In order to relieve the excess of water which accumulates on the race track and driveways ditches were constructed which proved equal to the occasion of the heaviest fall of rain. Gravel drives and walks were constructed so that people visiting the Fair would not necessarily have to be inconvenienced, and I believe I can truly say, and you will verify my statement on examination, that the grounds and buildings are in better condition than they ever have been since their construction.

I would suggest the propriety of holding at least a two-weeks' fair. Having visited the Texas State Fair this year, where they hold annually a thirty-days' meeting, where the exhibitors have generally permanent buildings of their own and of a substantial nature, they find that it is more profitable to both exhibitor and the association, as it gives the exhibitor a better chance to dispose of their products at a fair profit. Especially is this true of the manufacturers of buggies and agricultural implements, and I never witnessed a grander display than was made in these lines. I have the assurance from several prominent business men that they would gladly construct permanent buildings if the time was lengthened, as they all feel that the time is so short that it would not justify them in going to the expense for four days' exhibit, as they would no more than get their articles in place than they would necessarily have to begin to tear up. I have the assurance also of one of the leading newspapers of this city which would gladly erect a permanent building, and others would necessarily follow. The first exhibition of this kind occurred this year, which was eminently satisfactory to both exhibitor and patron. The cost of putting the buildings and grounds in order would be the same to the State Board of Agriculture for a four days' meeting as it would for four weeks; the additional cost of running the machinery after it was once put in motion would be slight compared with its organization and starting. Then, if we had a week's rain, we would still have an opportunity to pull out even. It seems to me that with the large investment in buildings and grounds that four days in the year are entirely too short a time to occupy them. Hoping this will meet your approval, I am,

Respectfully yours,

H. B. HOWLAND,

General Superintendent.

It was moved and seconded that the reports of department superintendents be referred to the Auditing Committee.

Motion carried, and the reports were so referred.

Convention adjourned to meet at 2 o'clock p. m.

SECOND SESSION, STATE BOARD OF AGRICULTURE MEETING.

MEETING OF INDIANA ASSOCIATION OF STATE FAIR MANAGERS.

SECRETARY'S REPORT.

To the Members of the Indiana Association of Fair Managers:

One year ago in this room, at an informal gathering of delegates to the Annual State Board Meeting, the feasibility of forming a State organization of all the Indiana county and district fairs was considered. Delegates were present from Lawrenceburg, Marion, Princeton, Crown Point, Laporte, Lafayette, Lebanon, Franklin, Bainbridge, Vincennes, Indianapolis Horticultural, Kokomo, Crawfordsville, Corydon, New Castle, Muncie, Elwood and Bedford.

A temporary organization was effected and H. L. Nowlin, of Lawrenceburg, was elected President; Joshua Strange, of Arcana, Vice-President, and W. M. Blackstock, of Lafayette, Secretary and Treasurer. A meeting was held in the State Board rooms on February 7th, at which twenty-four fairs were represented. At that meeting a form of constitution was presented and adopted.

The object of this Association is to conserve the best interests of local fairs in Indiana and, as far as possible, promote their greater usefulness and permanency. This object, it is believed can best be attained by systematic organization. Experience in all other industries has demonstrated that in matters of public business wherein large numbers of persons are concerned, that unity of action and concert of management are necessary to success. Therefore, as all fairs are akin to each other, the members of this Association believe that by holding frequent conferences in which the entire scope and design of agricultural fairs shall be studiously considered, their best schemes of management recommended and offensive ones condemned, that all our fairs can be made more effective and more worthy of public patronage.

For lack of co-operation with neighboring fairs, by petty rivalries, clashing of dates and other discreditable blunders, a great many fairs have gone out of existence, and for this reason many people think the day of fairs has hopelessly gone by. While in other localities they are still flourishing and as popular as in former years. The difference is chiefly a question of management.

Observation will show that where fairs are held in continuous circuit the co-operative principle is very essential. If the secretaries within the boundaries of any fair circuit work together in intimate and friendly relationships better results are obtained than can possibly be obtained by each secretary working by himself and for his own fair exclusively.

The organizers of this Association also hope that by securing a more intimate acquaintance with each other and by comparisons of programs and methods, a better understanding can be reached of the true intent and meaning of these public institutions. Every one should know what they are for and what lessons they should teach.

In a general sense they are educational opportunities, yet they are also, in a measure, for recreation and healthful pleasure; and hence, so long as agriculture shall continue to be the chief money-producing industry in Indiana the old time county fair will be recognized as a necessity.

Popular interest in well managed fairs will not decline. In several Indiana counties thirty or more annual meetings have been held with no sign of failure. In the older countries, France, Germany and England, great stock shows and general fairs similar to our own are still being held and have been popular events for more than two hundred years.

At the first meeting of this Association a special committee was appointed to draft a uniform set of rules governing the classification of property for the several show rings, entry fees, rental of stalls, privileges, etc., and submit the same for adoption by the several fairs.

The committee named was Messrs. Claypool, Downing, Blackstock, DeHority and Wishart. An executive committee and program committee were appointed.

This being our first annual meeting as a State organization, only a limited number of set topics were placed on the printed program, it being understood by the committee that at the proper time any important questions touching advertising, amusements, pool selling, circuit dates, or other incidental features of management would come up for discussion.

Respectfully submitted,

W. M. BLACKSTOCK,

Secretary and Treasurer.

HOW TO RUN A FAIR—SUCCESS DEPENDS ON EFFICIENT MANAGEMENT.

MANY FAIRS ARE FAILURES BECAUSE OF INEXPERIENCED MANAGERS—BEST FORM OF ORGANIZATION—GAMBLING AND "FAKE" SHOWS SHOULD NOT BE TOLERATED.

(A Paper read by Hon. Robert Mitchell before the Gibson County Farmers' Institute, held at Princeton, January 19, 1899.)

POINTERS FOR FAIR PEOPLE.

To people living in the agricultural districts there are few local events of more importance than the county fair. This institution, although less than seventy years old in this country, has grown so rapidly in popularity that nearly two-thirds of the 3,500 counties in the Union annually hold agricultural exhibits of some kind. No other attraction than the county fair can cause the people to turn out so nearly en masse, and the interest of a live community in the annual fair increases from year to year. All county fairs are not successful either as regards finances or in the matter of a complete display of the county's products, but those that are well managed—managed so as to command the support and respect of the people of the whole county, and perhaps of the adjoining counties—are almost without exception prosperous, and are a great and lasting benefit to the counties in which they are held. A fair, like a newspaper, is usually a reflex of the community in which it exists. Find a county with a poor exhibition of its products, and you have a locality sadly deficient in the life and enterprise necessary to the full development of its business capacity. The success or failure of the county fair depends, of course, very largely on the county and the people in it, but often in the best counties the fair is not what it should be, simply because of inexperienced management. There is everything in efficient management.

PLAN OF ORGANIZATION.

Successful management of county fairs depends first upon the organization; and of all the plans that have been attempted, that of a stock association has given the best satisfaction, and has stood the test of time longer than any other system. In such an organization, the shares of stock should be issued in quantity sufficient to give ample funds to fully equip the association grounds for the accommodation of its business. The price of these shares ought not to exceed \$20 nor be less than \$10, and three-fourths of the stock should be held by the most enterprising farmers

in the county, the remainder to be owned by residents of the city where the fair is held. The amount of land to be controlled by the association depends upon its capacity for doing business. If a large city is near to the grounds, and the county is thickly populated, a larger acreage is more necessary than under less favorable surroundings, but no association in these progressive times should own less than forty acres of land.

In improving and locating the buildings the same should be so distributed that the uncomfortable massing of visitors can be avoided, as the crowding of large throngs materially lessens the pleasure and comfort of fair patrons, and naturally the gate receipts as well. Another advantage gained by the proper and judicious arrangement of buildings is security in case of fire, which can be controlled more successfully among detached structures than when the same are grouped together.

A second important point to consider is the election of officers. The selection of these, as of all employes, should be effected with a definite object in view, namely, the securing of efficient and competent men, for the success of fairs depends greatly upon their management. The election of officers should be by ballot, and a clause of the constitution of the association ought to provide that no stockholder can cast more than one vote, two objects being attained by this rule: a better distribution of the stock of the association, thereby insuring more stockholders as active workers for the success of the fair, and the advantage that it prevents "rings" or "combines" from being formed for personal influence and profit, which usually result in unfair and unsafe fair management.

The officers of a successful fair, during fair week, must meet, be ever on the alert, and see that every reasonable want of the exhibitor is looked after, and each director should be assigned a department of the fair work by the president of the association. This officer should be elected because of his ability to fill the position, and he should know exactly what department a director can best oversee. It is imperative with the president that he sees that all minor officials perform their duties equally and with thoroughness.

ADVERTISE IN THE NEWSPAPERS.

The secretary must be a live man, and especially should he know the importance of printer's ink. The fair should be thoroughly advertised, not only in its own county, but in those adjoining. No exhibition will be a success without being well advertised. Every local paper within the territory from which it is expected to draw should be given a large display advertisement at least a month before the fair opens, and it is a part of the secretary's business from that time on to supply those papers with interesting paid references to the coming event. Some fair managers neglect this, or possibly they think it doesn't pay. An experience of many years upholds me in the assertion that it does pay, and pays well.

A county fair can't be conducted successfully without the aid and co-operation of the newspapers. It costs money to print newspapers, and it will necessarily cost money to boom the fair through those papers but it is money well spent. Successful fair officials already realize this fact. The papers are interested in making the fair a success, and, if met in a spirit of friendliness by officials, will, for a right consideration, give the fair all the space required to thoroughly advertise it.

The secretary should also be a man who will have every part of his work ready when the fair begins, and one who can, as well, take a good many cuffs and rebuffs with a smile. The general superintendent must likewise be up and doing at all times, as he ordinarily has to be in more places at the same time than any other official. He should have the nerve to enforce all regulations without fear or favor, which rules ought to prohibit every species of gambling or "fake" shows on the grounds, as no enterprise can long be successful and tolerate gambling.

PROHIBIT GAMBLING.

I know personally of a fair association that sold its gambling privileges for six hundred dollars. At the close of the same, the party who bought this right admitted that he had made six thousand dollars through his investment. Here were fair officials granting a man the power to rob their patrons of a large sum of money for a paltry bribe, money that otherwise might have gone into legitimate channels.

Some persons may argue that trotting horses tends to gambling. Such, however, is not the case. A good speed program is absolutely necessary to a successful fair, and can be had without pool-boxes or gaming of any kind, especially at county fairs, as the visitors to such are largely from the rural population, which, as a rule, does not, to any extent, indulge in betting. Races at fairs are usually held for the entertainment of patrons. The first part of the day is taken up by the showing of stock and other articles on exhibition. The after part of the day the visitors are inclined to rest. While resting they must be entertained, and no better amusement has been devised than a good speed program. Trotting meetings, with pool-boxes and betting on the results of races, are entirely different from trials of speed at county fairs.

Thirdly, successful fair management, to some extent, depends upon the amount of money offered in the way of premiums. This must be governed entirely by the gate receipts and rents from privileges sold, as these comprise the resources of the society to meet all expenses. Many fair managers, in order to increase their receipts, charge entrance fees or a per cent. upon the premiums competed for, but this is a mistaken policy, as it involves a tax upon the exhibitor, the party who makes your gate receipts possible. If the fair has a large exhibition, the gate receipts are increased, and success insured. No exhibitor ought to be taxed except

in the speed department, and that is done for the purpose of securing honest races. The popular fair must be managed by public-spirited men who are willing to give their time without hope of reward or dividends for money invested. If so governed, the public good will be built up, and successful fair management will crown their efforts.

DISCUSSION OF MR. MITCHELL'S PAPER.

I do not exactly understand what you mean by what you said about entrance fees. Do you condemn entrance fees?

Mr. Mitchell: Yes; I think the exhibitor ought not to be charged anything. In England exhibitors who have fine stock are often offered a bonus to exhibit their stock. The expense of exhibiting is great, and if the exhibitor comes out even he does well.

Mr. Blackstock: In fairs in northern Indiana we nearly all have this condition for an entrance fee; no entrance fee will be charged, but a deduction of five per cent. will be made upon the premium.

Mr. Mitchell: We give free stall room and allow two men for a herd of cattle and one man for a team; and all of the help to come in free.

Mr. Blackstock: I have never heard any expressions of discontent from exhibitors for the deduction of 5 per cent. from the premiums. I have been Secretary for seven years of the Lafayette Fair, and have never heard any expressions of dissatisfaction. If the exhibitor has a ribbon, and has the reputation for having taken the prize, he is very well satisfied, for that is what he comes for more than money.

Mr. Overstreet: I will say in regard to the Johnson County Fair that we think we have a successful fair, and we charge for all exhibits. We charge the exhibitor for coming in, and if we can get him to go out we charge him for coming back in again.

OUR DUTY AS CITIZENS OF INDIANA TO THE STATE BOARD OF AGRICULTURE.

J. D. WILLIAMS, VINCENNES.

We must educate or we must perish. This maxim was probably never so strongly demonstrated as in our recent war with Spain. No prettier picture can be drawn, to my mind, illustrative of this, than the charge of our boys up the San Juan hill.

Educated to the fact that they were Americans, forgetting that they were of the North or of the South, East or West, but taught and trained as Americans are, their only thoughts were of American freedom and liberty, and eager to extend this to the suffering Cubans, they charged on and on until the Stars and Stripes were seen there floating, declaring to the world the results of educational training. The question may then be asked, What has the State Board to do with education? Then I ask, For what was it created?

It was created for the purpose of education, bringing together, as no other means can, the products of the many pursuits and avocations of life.

From the humble cottage to the mansion. From the commoner to the wealthy. The countryman to the statesman. Mingling together with their being, thoughts, actions and words on no other occasion as when attending our annual State Fairs.

It was an often heard remark of some foreigners during the World's Fair, "It is wonderful how many nationalities, people of so many pursuits and stations of life are here mingling together with little or no embarrassment in any way." Many of them asserting that "it would require a standing army in any other country to preserve the same order."

The State Fair Grounds being a property of us in common, as citizens it is our duty to use our influence in securing and electing good men as members of our State Board. We can only do this by attending the State Board meetings. There consult representatives of the different parts of the State, and of the different pursuits and callings. The tiller of the soil. The live stock breeders. The butcher, the feeder, the merchant, the miner. the lawyer, the doctor, the theorist and the practitioner.

Then elect the best of these we possibly can. We can not have a truly successful Board by electing all of one or even two classes. All go to make up the educational system of our great State.

Did you ever hear of a successful fair being run exclusively by farmers? Did you ever of merchants? Did you ever of the lawyers or the doctors? Or of the practitioner or theorist? Echo answers no. We sometimes use the word agriculture in too broad a sense. After having made

our selections it then becomes our great duty to give them our hearty co-operation. Either by word, deed or action. A little from each of us, though not much, but from here and from there gathered together soon represents much. The exhibition of itself is not the all-important factor in making a successful fair.

You as a farmer may give some suggestion of entertainment that will be more inviting to your class. You as a merchant may of your calling. You as a professional may of yours, and so on. We owe our attendance. We owe our influence in getting our friends to attend. We owe our efforts in getting each other to see and understand that it is an institution of our own, not of the Board, but that any effort or influence that aids in the financial as well as the instructive, benefits us individually as much as the Board. The hand and signs of welcome of the citizens of this city have much to do with the encouragement of attendance.

One would be surprised at the difference in this respect of our Hoosier city and the Sucker city. No doubt the fame of Springfield for their superb decorations, their efforts in entertaining visitors has had much to do with the success of the great Illinois fair.

It is but for the citizens of Indianapolis and our State to give this question its deserved recognition, when we may be able to cope with our sister State in any event.

Let us also enlist the press to a more satisfactory service. I can not help but recall the words of Dr. Talmage on this subject. Shortly after the beginning of the questioning of the propriety or impropriety of keeping an army in the Philippines, he stated that with the press and its power, as Americanized, established there it would do more to establish government and subdue the recalcitrant than all the soldiers of our country. Who will attempt to deny that the pen is not mightier than the sword?

Hail to the press. The exhibits at the World's Fair, and the State Fairs since, together with the press, have done more to educate the people of the necessity of improvement in every branch of industry than all their influences. Hence rises the importance of the improvement of our fairs. It is just as important for the change of program and tactics of our fairs as it is needful that our business man change. Changes in our Board, its membership and its management is sometimes needful, and as citizens we owe our assistance to that end.

To-day is not yesterday; we ourselves change. How can our works, our plans and thoughts, if they are always to be the fittest, continue the same? Change, sometimes, is painful, yet ever needful. We feel this most when we have experienced it too late. It is not my motive, friends, to criticise but to invite criticism. It is the critic that excites, that causes reform if needed. It brings our thoughts into action, and cultivates us. I do not desire to enter into the details as I feel needed on the subject treated, but to only try to present to you a skeleton for discussion.

Another important duty I feel we owe is our influence upon our legislators, the necessity of its aid to the State Board. Do they not give aid to other educational institutions? Is there one here who would deny an appropriation of \$10,000 every two years would not be of more benefit, educational and instructive, generally to the citizens, classes and callings at large than many of our thousands given to other institutions.

Do the State Boards of Ohio and Illinois deserve recognition at the hands of the legislators any more than ours? I leave the answer with you, but may it be considerate.

With the help, however little, we may and can give to our State Board, from the humble, the rich, the unlearned, and the classical associating and mingling together as at no other time; forgetting rank or station but educated to the fact that we are all God's beings.

No more beautiful tribute to our Maker could we give. And friends and citizens, with this in mind, and the fruitage of however little we may do, I feel that the schoolday poem, "Help One Another," is here very appropriate.

"Help one another," the snowflakes said,
As they cuddled down in their fleecy bed:
"One of us here would quickly melt;
Were either to go it would be quickly felt:
But I'll help you and you'll help me,
And then what a big white drift we'll see."

"Help one another," the maple spray
Said to its fellow leaves one day;
"The sun would wither me here alone,
Long enough ere the day is gone;
But I'll help you and you help me,
And then what a splendid shade there'll be."

"Help one another," the dewdrop cried,
Seeing another drop close to its side;
"This warm south breeze would drive me away,
And I should be gone ere noon to-day;
But I'll help you and you help me,
And we'll make a brook and run to the sea."

"Help one another," a grain of sand
Said to another grain just at hand;
"The wind may carry me over the sea;
And then, oh, what will become of me?
But come, my brother, give me your hand;
We'll build a mountain and there we'll stand."

It is here we may as citizens of Indiana exhibit our State pride as in no other form. Here we may work regardless of politics or creed. Should we criticise let us do it in refinement. With the expectation of elevating rather than degrading. Always speaking a good word.

Have you ever thought of the weight of a word,
That falls in the heart like the song of a bird,
That gladdens the springtime of memory and youth,
And garlands with cedar the banner of Truth,
That moistens the harvesting spot of the brain
Like dewdrops that fall on a meadow of grain,
Or that shrivels the germ and destroys the fruit.
And lies like a worm at the lifeless root.

DISCUSSION ON MR. WILLIAMS' PAPER.

Mr. Bowles: I believe the duty of all good citizens is to render the State Board all the aid they can, to uphold them when they are right and condemn them when they are wrong. We should also do our duty in electing men to the Legislature who are friendly to the State Board of Agriculture. As a member of the Wool Growers' Association, I have been attending the meetings of that Association, and have noticed that there is no one at the meeting who is not interested in sheep breeding. I think the reason is that there is no prestige or advantage to anyone else in belonging to the Association. I do not see why some doctor, or lawyer, or artist is knocking at their door with a dollar in his hand begging to be admitted as a member. The Mayor of Indianapolis recommended this morning that we have members of other professions belonging to the State Board. There are reasons why I criticise the State Board in its management of the State Fairs. There is a lack of promptness in opening the buildings that I do not think there would be if farmers were in charge. Two years ago I went to the Art Hall at eleven o'clock on Wednesday morning and found it not yet opened to visitors, and ascertained that it was in charge of a professional gentleman. Nine o'clock is considered early by them to get to business. If agriculture is going

to lose its identity in the management of the State Fair, the time will come when the gates will be opened to the show herds and they will be turned out in the pastures, and instead of the Battle of the Breeds, as led by ex-Governor Matthews some years ago, you will have dancing women and other sights that will cause every decent man to take his children and retire from the grounds. Who was responsible for this? Some man who was a member of the State Board of Agriculture. Whoever was responsible for this sort of thing should be banished from the Board, whether he be lawyer or farmer. The last fair was sneered at by some people as a "Granger Fair." When the report of the officers told the truth it was found to be one of the best ever held in Indiana. The title "Granger Fair" was a proud one for it. I am ready at all times to invite all the help we can get, but it seems to me everybody has a day except the farmer, and he has it only provided he has a half dollar.

I have nothing to say about the professional gentlemen, but they are not in any way interested in agriculture beyond the extent of any common citizen, and it is out of place for them to be members of the State Board of Agriculture. Would the Mayor of Indianapolis place a farmer on one of the boards under his control? Would the association of artists in this city admit me as a member? For the same reason that I could not be admitted to one of the above associations I claim that the management of this Board should be controlled and constituted wholly of agricultural men—practical farmers.

Mr. Gifford: Whenever we say "Close the doors! shut out brains!" whether belonging to the doctor, the lawyer or the farmer, like Governor Matthews, we are making class distinction and cutting the throat of any institution. Shut out the doctor from this Association, forsooth, because he knows the anatomy of the human being! Is that the way to get the interest and the sympathy of the whole State? Surely not. Why, the best Jersey cattle breeder I know of in Indiana is a physician, a specialist, and one of the best in his line in Indiana. He has thousands of dollars

invested in real estate, and thousands of dollars invested in beautiful, valuable Jerseys. Should he not belong to the Association, or have an interest in it? I know a man in northern Indiana who owns thirty thousand acres of land, who has drained more land than any ten farmers who ever belonged to the State Board, who has done more to increase the natural value of northern Indiana than any ten men that I know of who belong to the strict profession of agriculture. We must broaden out, and whoever can help let us ask him in. If he be a farmer and has only one pig and a cabin, whose fences are down and the blackberry bushes in the fence corners, shut him out, he is not worthy to belong to it; but if a lawyer has a farm and takes care of it, let him in. As well say to the doctors and lawyers who are farmers, Leave the professions because you are farmers! We do want the hearty co-operation of every man, woman and child in Indiana. When we have the expression of all the citizens of Indiana we will have the perfect fair. It will not be for farmers, not for lawyers, not for doctors, but for all. When we all help each other we will have a State Fair here that will be a credit to us, and we will get the hearty support of all classes.

I do not say that the State Board never makes mistakes, but I do say I think all the members are doing their best to make it a success. They may have allowed hoochie-coochie dances into the fair, I do not know about that; I can not say from experience. I did not run across it; and there may have been gambling games there, for I fear the fellows in town are not all as good as we fellows out in the country, but I did not see it.

Mr. Mitchell: I wish to say a word in answer to the gentleman who criticized the management of the Art Department of the State Fair. The Art Department is one of the hardest to manage on the ground. He happened to come there one morning when it was not ready. When the exhibit goes on the wall every kind of picture must go by itself so the judges will be able to judge them properly and readily. Because they were not ready at ten o'clock was not

the fault of the fair management, but the fault of the exhibitors who did not have their pictures there in time. I served in that department four years and we were never able to get ready before Tuesday.

This Association is an Association of fair managers, and I do think with Mr. Williams that every one here ought to join hands to give the State Fair managers the exclusive right to the week that they choose to hold it on. I would be glad to see every county in the State give the Board the right to that week, and do what they can to make the fair a success.

Mr. Williams: I am glad that my paper drew out the criticisms. That was the object of the paper. A paper is of little profit unless it is discussed. These subjects were treated from a farmer's standpoint. I was born and reared a farmer and have never been anything else. All my possessions are in farms and farm property. No one has greater zeal and earnestness to see the farmer succeed in his daily avocation and in his exhibit at the State Fair and at the county fairs than myself. If the fair is not an educational institution, what is the use of bringing our sheep and cattle there? This is especially true of the beef breeds. We are all striving to learn how to produce the greatest number of pounds of beef at the least cost. The same is true of the sheep breeders. The man in that department of industry breeds for the wool and the mutton. The man who manufactures articles for farmers' use, if he does not come out there and meet the farmer and compare the products of his factory with others, and get the expression of the farmers who use them, cannot know if he is manufacturing a superior or an inferior articles unless he exhibits them. It is an education from first to last. It educates us to bear in mind that it is economy practiced with industry that is best for all of us, whether we are farmers or lawyers or doctors.

NEGLECTED THINGS BY MANAGERS OF FAIRS.

HON. CHARLES DOWNING, GREENFIELD.

There are some things overlooked and neglected before the fair, and there are also some things overlooked and neglected during the fair. I shall first notice the things neglected before the fair.

My observation and experience covering a period of fifteen years as an officer and manager of a county agricultural association leads me to believe that the most important thing neglected before the fair is the selection of competent officers and directors. As a general rule, little or no attention is paid to the annual election of officers and directors, and it is very often the case that men are elected to fill the places more on account of their popularity than for their qualifications and fitness to conduct fairs successfully. Successful fairs are the result of systematic, intelligent and hard work, done months before the exhibition is on. No fair, I care not how successful it has been, can be made after the gates are opened. In a great many instances the annual meetings at which its officers are selected are neglected, and, as a result, incompetent directors and officers are chosen. In my judgment the success of a fair depends more upon the selection of good business managers than anything else. If you have competent officers, there is nothing overlooked or neglected. It has been demonstrated time and again that an agricultural fair will not run itself. It is just as essential and important to have good business men at the head of a fair association as it is to have them manage any other business enterprise.

You have heard on all sides that the street fairs, so popular at this time, are to take the place of county fairs, because they are so much more successful. If you will investigate the question, you will doubtless find that the popularity and success of these entertainments are due directly to the efforts, energy, push and good judgment of good business men. So I say that it is very important to attend the annual meetings and assist in the selection of good fair men to fill the offices.

Particular care should be taken in selecting the President, Secretary and the General Superintendent, as it is upon these officers, mostly, that the success of the fair very largely depends. The fact that a well-known, accommodating, agreeable and approachable man is the President or Secretary of an association will often bring exhibitors to a fair, and, everything being equal, an exhibitor will always go to the fair where he knows the officers personally and receives the best treatment. It is not an uncommon thing to hear exhibitors complain of harsh treatment by fair officers. My observation has been that as a rule regular exhibitors

are good business men and give very little trouble where they receive fair treatment. They usually know what is required of them and know what their rights are.

Revising the premium list and rules is sometimes done hurriedly and incompletely, and very often it has to be corrected after it is printed and distributed, and I have occasionally seen it revised and amended before the exhibition could proceed. Too much care can not be taken in perfecting the list before it goes to the printer.

Some associations neglect to join a fair circuit. To belong to a good fair circuit is quite an advantage in many ways. Where your association is in a good circuit it is easier and cheaper to advertise your fair, and you get a better class of exhibitors and many other advantages. If the associations composing these circuits would adopt a uniform system of classification, rates and rules, they would be more effective. In the past few years, the fair managers have been trying to accomplish something in this direction, but have not succeeded so far. A strong and combined effort should be made to do something in this line. An important matter very often overlooked is the failure to make contracts for all printing, supplies, advertising, expert judges, policemen, laborers, special attractions, etc., in advance of the fair. Loose habits have grown up with many associations in making purchases, advertising, etc., without contracts, with the result that outrageous and extravagant prices are often charged and exacted by reason of the failure to make contracts at the proper times.

We sometimes make a great mistake in getting out a cheap and poor class of paper to advertise our fairs. Good advertising always pays well. Newspaper advertising is essential, as it goes into the homes of the patrons of the fair.

Sometimes the putting of the grounds into proper condition is put off too long and when the fair is on extra help at additional expense has to be employed to get things in readiness.

In a very dry season it pays the association well to have the track and driveways through the grounds thoroughly sprinkled, and it is good policy to have the street from the station and town leading to the grounds sprinkled at the expense of the association, if it can not be done otherwise.

Many times not enough attention is paid to the character of the privileges sold and allowed on the grounds. Fake shows, the sale of intoxicating liquors and gambling schemes are almost and ought altogether to be a thing of the past in the agricultural fairs in Indiana. It has been demonstrated repeatedly that fairs can be successful without them.

There are some other things neglected before the fair, such as the failure to select expert judges, competent and gentlemanly gate keepers, ticket sellers and policemen. Cleaning out and filling stalls and pens with straw at least by Friday before the fair. These things are put off

too late, sometimes, and the result is that incompetent persons are selected when the fair is on.

In all the live stock classes lists of competent expert judges are published by the different live stock associations and registers, and there is no difficulty, if looked after in time, to get competent judges in any of the departments.

I will pass to some of the things neglected during the fair, and to my mind some of these are more important than those I have alluded to.

Neglect on the part of members of the Board of Directors to attend the meetings of the Board during the fair causes annoyances to persons having business with it, and delays the work of Superintendents and disconcerts exhibitors. If the rules provide for a meeting of the Board at 9 o'clock every morning, they ought to be attended promptly, and if any of the officers or Superintendents are compelled to leave the grounds they should provide for an assistant or leave word with the Secretary when they will return and where they can be reached while away from the grounds.

Perhaps the most important matter neglected during the fair is the failure to carry out the program with promptness, especially the race and amusement part of the program. Unnecessary delays in starting the races on the advertised time wear out the patience of the patrons of the fair, especially those who live in the country some distance and who are often compelled to start for their homes without seeing the races finished. The Superintendent of speed can do much to remedy this annoyance, by selecting a competent and prompt starting judge. I have attended fairs where the expert judges were not protected from criticism and abuse by disappointed exhibitors while in the discharge of their duty in the show ring. This can be prevented by prohibiting such conduct by stringent rules and forfeitures, and excluding such persons from the show ring. A well conducted fair will provide protection for its judges, and will not allow unfavorable comment when awards are made, or allow any person in the ring except attendants in charge of stock.

If exhibitors are not satisfied with judges a proper remedy is afforded by protesting against the judge before he goes into the ring, or appealing from his decision, if it is dishonestly or corruptly given.

In this connection I will remark that the announcement of all awards on live stock should be made for the benefit of the spectators. This is often neglected. The patrons of the fair are entitled to see the exhibits made at the fair, and sometimes it is inconvenient for them to be present when horses and cattle are being shown in the ring. In view of this fact, the exhibition horses and cattle should be unblanketed for a few hours each afternoon during the fair, so as to give these persons an opportunity to see this class of stock.

You will all agree that it is not very satisfactory to look at a show animal through a hole in a door and blanketed at that. The doors to stalls

should be opened and blankets removed and gentlemanly attendants in charge to answer inquiries. These things you all know are woefully neglected at some fairs.

If this suggestion is impractical, then do not neglect to have the parade of the premium horses and cattle in the afternoon of the last two days of the fair, so that the people may see what is on exhibition in these classes. To my mind the parade of premium stock is one of the most interesting features of the fair, and it can take place after the grand stand has been filled and while the races are being called without interfering with the race program.

Sometimes there is great neglect in allowing the grounds to become littered and filthy during the fair. This can be avoided if the Superintendent of the grounds will employ a man specially to attend to cleaning up every day.

The water supply is often overlooked to the inconvenience of the patrons of the fair, particularly if the weather is dry and hot, and the sprinkling of the driveways, tracks and roadway leading to the town should never be neglected.

I know that these things involve some expense, but they bring good returns. Many conveniences for the comfort of patrons can be provided at almost no expense, which are overlooked. Check rooms, information bureaus, benches in the shade, hitching racks, etc.

Officers of fairs should arrange their work so that they can give some attention to officers of other associations who visit the fair to gain information and advertise their own fairs. A friendly visit and an exchange of ideas will benefit both. I have gotten some excellent ideas from visiting other fairs and watching the management of them.

A matter which is neglected by most if not nearly all the fair associations is the failure to pay its premiums awarded, on the last day of the fair where the association announces that it will pay all premiums in full. It is just as easy and requires less work on the part of the Secretary and Treasurer to pay all premiums on the last day as it is at any other time. In my experience I have found that this plan not only saves a great deal of work to the Secretary and Treasurer, but it pleases the exhibitors and makes the association that adopts it very popular. I have always advocated this plan and followed it, when the Board of Directors would allow it.

Another thing neglected is the encouragement of local exhibitors. The original purpose and object of the county agricultural fairs was to educate the farmers, stock raisers and manufacturers of the locality where the fair was held, by awarding prizes to meritorious exhibits. This caused a friendly rivalry among the enterprising people who made exhibits, and resulted generally in stimulating the unsuccessful exhibitor to produce and show something better at the next exhibition. But now the tendency seems to be to encourage the professional exhibitors, who start

in with the first fair and continue showing until the fair season closes. I think some plan should be devised or some inducement should be held out to the local exhibitor, if we are to get the full benefit of the interest of our home people. The object of these annual exhibitions is not altogether to put money in the treasury, but rather to educate the people up to the point of producing better crops, better stocks and better manufactures. I do not want to be understood as being opposed to professional exhibitors. They are indispensable to all exhibitions. But I believe a better local interest can be worked up, by holding out some inducement to our home people, who desire to make exhibits and who are unable to compete with the professional exhibitor.

The point I desire by these remarks to make is that the details of the management of a fair are the important things that should be looked after. With competent and courteous officers, close attention to details, ordinary prosperous times, and favorable weather, the county agricultural fair is bound to be a success.

It is remarked occasionally that the old fashioned county fair is on the decline. This is true, but the up-to-date county fair is and always will be, I trust, one of the permanent institutions of the country, particularly the Middle West.

There are doubtless many other things that are neglected that I have overlooked, which suggest themselves to your minds, and I trust that in the discussion which follows you will have no hesitancy in mentioning them.

DISCUSSION ON MR. DOWNING'S PAPER.

Mr. Blackstock: I wish to discuss the point made by the writer of the paper in regard to the professional exhibitor. We made the experiment in Tippecanoe County Fair in the women's department. People can buy goods or secure them in some way and send them to our county fairs and take premiums. We limit entries in the Tippecanoe County Fair in the women's department to articles produced in our own and adjoining counties. We do not make the limit so narrow that nobody but the ladies of our own county can exhibit; all the adjoining counties are recognized. We simply cut out the people from a distance, who are very often frauds. For the last two years the exhibits in the women's department have been larger and better than they were when the whole world would exhibit there. It is satisfactory to our own people, and that, after all, is the principal thing.

Mr. Waugh, Tipton: For a number of years Tipton County had a fair, but two years ago it went to the wall financially, with an indebtedness of \$3,000. A year ago we formed an association for the purpose of running a county fair. I think the speaker made an excellent point when he said the premiums should be paid when it was announced that they should be paid in full. In organizing our fair association we received no encouragement in the beginning from the old fair managers. We went ahead, however, and advertised it thoroughly in every way possible. We advertised through all of the usual channels and then posted bills. I posted 3,600 bills in Tipton County in seventeen days. We carried on the advertising until it was time to open the fair. We fixed up the buildings and grounds, and when the fair started out men came forward and wanted guarantees and assurances. Tuesday we commenced taking gate receipts. Wednesday we were to have the races. Thursday was the day we needed money. The men who had horses there said they would not bring them out until the money was ready. There was at that time about \$600 of gate receipts, but that was not enough. I assured the men that the checks would be ready when the horses passed under the pole. The result was that by afternoon the receipts were sufficient to meet the requirements, and we paid every dollar, and came out at the end of the week with \$670 in hand and no unfriendly feeling on the part of anyone.

Mr. Williams: You know there was dissatisfaction here last fall at the State Fair resulting from exhibitors not knowing who judges were to be. Many people after coming here would not show. Is it not better to have exhibitors who do not wish to exhibit when the names of certain judges are given to stay away than to have them come on the ground and then refuse to exhibit? I think the State Fair and all large fairs should announce the names of the judges in their premium lists; then when people wish to exhibit they know who is going to pass on their exhibits, and there can be no ill feeling after the awards are given.

Mr. Downing: I am opposed to this. We must look at the question from the fair manager's point of view. Whenever you publish the name of the judge at the head of the list that goes all over the country, every exhibitor who is opposed to him will stay away and not exhibit. But I am in favor of the judges in the different departments being selected from the lists of judges furnished by the associations of people interested in these various departments. All that the exhibitor is interested in is having the judgment of an honest man and a man competent to pass upon his stock. He is not entitled to have a personal friend in the ring, but he is entitled to have the judgment of an honest, competent man. The Fair Association is also interested in this and ought never to select an expert judge who has ever been tainted with fraud or suspicion; and if there is any valid objection to a judge who appears in the ring, that objection should be made before he enters the ring and while there is time to select or telegraph for another judge on the list.

FAIR DATES.

Mr. Blackstock: The first date to be established should be the date of the State Fair. Last year a good many fairs in Indiana were embarrassed in fixing their dates because they had published their dates before the date of the State Fair was announced. Many others held off because they did not want their dates to conflict with the date of the State Fair. Last year there was some difficulty in getting the State Fair to fix its date, and it was not until about the first of March that it was finally settled upon. The date of the State Fair ought to be fixed at this meeting, so that the county fairs can fix their dates at once.

The following resolution was offered by Mr. Mitchell, of Princeton:

Resolved, That the State Association of Fair Managers favor giving to the State Board of Agriculture the exclusive right to the week selected by the Board for the State Fair; and that said Board at the earliest time possible name the week, so that fair associations may take action, and arrange their dates so as not to conflict with the week selected for the State Fair.

DISCUSSION ON MOTION.

Mr. Blackstock: I think I have seen more fairs ruined by conflicting dates than by any other one thing. I believe that friendly co-operation in this matter will bring the best results. It is utterly impossible for any fair to be held in Indiana without conflicting with the date of some other fair for there are several times as many fairs as there are weeks in the fair season, and it is asking a good deal for the State Fair to consume the entire time of one fair week. I suppose it would not make much difference if fairs were held the same week in the extreme northern or southern portions of the State; but in all the central portion of the State no fairs should be held during State Fair week. In the remote parts of the State it would not matter so much, for some of these places have very little intercourse with Indianapolis.

Mr. Hewlett: I think the Board at its present meeting ought to fix the date of the State Fair. I think most of the fairs are waiting to hear this date so that they can fix theirs. We are waiting to hear from them, and I think other counties are doing the same. It is at this meeting it should be fixed. I do not think the third week in September should be fixed on, as that will bring you into conflict with all the schools of the State. Where there are six or seven months of school they will begin the week of your fair, or even before. I think the second week would do better. Then there are no schools in session, except in a few of the cities. I think this would make an important difference in your attendance.

Mr. Mitchell's motion was carried.

Mr. Blackstock: Inasmuch as this Association is rather informal in its character and is designed merely to be helpful, to give an opportunity to fair managers to talk about the details of fair work, we need very little money for our work. I am inclined to make a motion that every fair association represented here be

considered a member of this Association, whether he pays dues or not. This is not a money making association; it is merely a meeting at which we can talk about fair business.

Motion seconded and carried.

UNIFORM ENTRY FEES.

Mr. Blackstock: At the last meeting there was a committee appointed to draft what they considered a proper and uniform set of rules to govern entry fees and the classification of articles in the certain departments, so that there would be a uniformity as far as possible in getting up the premium lists. When an exhibitor comes from one fair to another he is familiar with the rules and conditions of the first one he attends, but does not know what the rules of the next one will be. This is confusing and sometimes disappointing. There was an expression of opinion at the last meeting that there might be a set of rules formed that would unify the system and make it easier for the secretaries and for the exhibitors. Under this system before an exhibitor came on the ground he would know just what the conditions were and would be prepared for them.

Mr. Mitchell: I think it would be a great advantage to have a uniform system of privileges and a uniform system of charges at the gate. We can get this through our Fair Association, and it will be a great benefit to the managers as well as to the exhibitors.

AMUSEMENTS AND ADVERTISING.

Mr. Aaron Jones: So important a matter as that of advertising ought to be thoroughly discussed. It is one of the incentives or one of the preliminaries to success to know how to advertise. I have my own individual opinion as to the best methods. The hanger, the poster, and all of that sort of advertising are good to call attention to the fair; but I believe that the best advertisements

are those that go into the homes of the people of the country. What goes into the homes of the country are the weekly and the daily papers. I believe it would be very much to the interests of the fairs of the State if a major part, or a larger part, of the money expended in advertising were given to the press. The press is the educator, to a large degree, of the people. People look to the press for all matters of interest. I believe that all fairs ought to have such attractive features and such advantages that they can be clearly set out in the press. Let those advertisements be in the reading matter, and let them show the advantages and benefits of attending the fair. I believe this will impress the people more than posters or hangers. I think the time has gone when bills are of any use in advertising a fair. That which brings people to the fair is advertising. I do not believe that any fair ought to be run, or ought to have an existence whose exhibits are not of such a character that every man, woman and child who attends will get more than value received, both for time and money expended. If the fairs are not sufficiently educational in their tendency to bring about this result, then there is no excuse for the fair. The fairs must be so managed that the father and mother can safely take their family to this fair and not have their morals or sense of propriety interfered with. I believe it is a part of the duty of those who have this great branch of educating the public along the line of better agriculture to keep always in mind that we should educate the man, the boy and the girl to a better life. The fair association can do this. Unless fairs are educational along both these lines I do not believe there is any justification in their being sustained. Therefore, it seems to me that these matters that ought to be clearly set out should be not in short paragraphs, but in well considered articles in the public press. This sort of advertising would not cost much if the fair managers were liberal to the press. For three or four weeks before the State Fair occurs papers in every county should have well considered articles setting forth the advantages of it. If this were done I do not believe there is a county so remote that it would not send a large number of its

citizens to see the beauties of the State Fair, the beauties of their Capital City and the beauties of the country through which they would pass.

Every county in the State is equally interested in the State Fair. If this were not so I could not consistently stand before the Legislature and ask a continuance of the appropriation. The appropriation is for bringing up the agricultural interests of the State of Indiana, and if there is anything that has ever given more renown to our State than any other one thing it is the prominence of the agricultural interests of the State. I believe that a course that would place on the streets, in the hotels, the boarding houses and in the camps and locations around the city of Indianapolis, instead of 45,000, which is the highest number in attendance for a number of years that we have had, 100,000 or 150,000 would be the proper one to pursue. I believe it can be and will be done when you popularize the educational advantages of the State Fair. And you can do that through the public press better than through any other medium. If advertising and creating an interest in the State Fair through the press gives us this result, it seems to me it is the duty of every fair manager to bring out the people in this way so that the advantages of the fair and of the city will go to every portion of our State.

It requires talent and ability to state this fair matter properly, and present it in a form that will be creditable and will make an impression on the people. I believe you will find that the best style of advertising. With the rural free delivery the circulation of the daily papers have been more than doubled in the last year, so this information would reach a large number of the people through them.

ELECTION OF OFFICERS.

The following officers were placed in nomination:

For President, H. L. Nowlin.

Vice President, Joshua Strange.

For Secretary, William M. Blackstock.

A motion was made that the Secretary be authorized to cast the vote of the association for each of the three officers nominated. The motion was seconded and carried, and the Secretary cast the vote of the association, and the officers were declared duly elected.

A motion was made and carried that the President appoint a Committee on Program, to consist of three members.

The President appointed Mr. Robert Mitchell, Mr. W. M. Blackstock and Mr. E. A. Robinson as such committee. It was afterwards decided to add another member to the committee, and Mr. Stephen Dungan was named.

Adjourned sine die.

THIRD SESSION OF THE STATE BOARD OF AGRICULTURE.

Meeting called to order at 10:00 Wednesday morning, January 3, by President Stevens.

THE INDIANA STATE FAIR; THE RECIPROCAL RELATIONS OF MANAGERS AND THE CITY OF INDIANAPOLIS.

HON. E. B. MARTINDALE, INDIANAPOLIS.

Gentlemen of the Delegate Board—For many years whatever speaking I have done I have done in an extemporaneous way, so I have no prepared speech now.

I have been identified with the State Board of Agriculture for the last thirty-five or forty years. I have been identified with it in its different modes, and I assure you I have not made anything by my connection with it. I purchased the old State Fair Ground, and, whether the Directors are smart enough to run a State Fair or not, I give them the credit of

being smart enough to get away with me in that deal. You can see what was done by the sudden transformation of that ground when you ride through Morton Place, as it was named, in the five or six years since it was purchased. A beautiful city has grown up there. I took an active part in the selection of your new location. I favored that location, and I believe still it was the best possible location you could have had.

In looking to the success of the State Fair there are two or three suggestions I have to make that I have not thoroughly studied, and may be mistaken about. I have noticed that you spend the same amount of money in preparing for a State Fair of three or four days that you would have to spend in preparing for a State Fair that would last eight or ten days. It takes all of Monday and Tuesday to prepare for the show, and then if a rain strikes you on Wednesday, Thursday and Friday, the result is that your receipts are cut off. If you will go back over the report made by the President in his speech yesterday, I think you will find the occasions when it has been a failure, or a comparative failure, have been upon weeks when it rained, and your receipts were cut off.

Of course the preparations for a fair to continue two weeks are no greater, and the expense in such preparations is not much greater than it is for a week, and by widening and extending the scope of your operations and dividing the show into days, fixing days for cattle shows, days for hogs and for sheep, you would give greater opportunity to the people who are interested in each class to see the things that interest them most. A great many of the exhibits are brought in with the expectation of selling them, and it would give the exhibitors a better opportunity to sell, and would give the people a better opportunity to see the character of the stock brought in if there was a day on which there was a special show for cattle, or for hogs, or for sheep.

My opinion is that the way out of a loss for the State Board would be to make a two-weeks' show. You would spend very little more for a fair of that length than for one lasting only one week; it is simply a question of having more days and more receipts. In a fair of that length you can pass the rainy days and come out all right. Whenever you adopt that method, after full consideration of it, I believe there will be no year when the State Fair will not be a paying institution, and a good paying one, too.

Of course it looks to you who have been giving a three-days' show as if that was widening out too much, and as if there was danger in it. There can be no danger in it if you do not increase the amount of your expenses, and you can not increase any except the running expenses. You have the same amount of preparation, you have the same premiums, the expenses are the same, and instead of being cut off with a three-days' show you have a six or seven-days' show. I believe if you ever try this method you will make money.

The success of the State Fair depends very largely upon the ease with which you can reach it. So far as I know, and I am judging by observation, the transportation to the State Fair, while there has been a great deal of boast about it, has been entirely inadequate, and the inadequacy or failure of proper transportation falls upon you and the loss comes to you. The street cars do not cost so much but that one can be run every one or two minutes as well as one every ten minutes. The most pleasant way, of course, to go back and forth to the Fair Grounds is on the street cars. Even people who have horses and carriages do not care to take them out there. They do not care to have the care of vehicles; they like to be free to enjoy themselves. The State Board of Agriculture ought to insist that there shall be better facilities for transportation for people wishing to attend the State Fair. This thing of inadequate transportation from the city and back is hurting your fairs more seriously than anything you have had to contend with. I speak now from absolute knowledge. I know that when you have started off on the big day that the people have been crowded together in the cars like cattle, men, women and all, jammed in in such a way that when they get home they resolve never to go out again, and advise their friends not to go out that way. What is the effect? The effect is that that much is taken off your receipts.

Great promises were made to you and to me when we located the State Fair at that point. It is a delightful location, and you have done splendidly in fitting it up, and there is no reason why there should be a lack of the best and fullest transportation facilities. I hope that whatever the relations of the city of Indianapolis may be, whatever may be due in the way of co-operation and strengthening and building up the State Fair, that one thing will be demanded, that your Board of Directors notify the Street Railway Company that you will have to resort to the railway cars and give them opportunities that they may increase their facilities for transporting the people to and from the State Fair Grounds. But the street car is, after all, the right thing, and you know there is no trouble so far as time is concerned. They can go in there and carry the people back and forth with perfect ease. Very largely in proportion to the ease with which they can go back and forth is your attendance and your receipts at the gate affected.

If I were a member of the Board I should see to it that a transportation, free, easy, comfortable and ample should be provided by the street car company, and that they should put on twenty cars where they now have one. Cars are not expensive, and they will pay for a car during the week of the Fair. Let them put them in, and make them understand that they must put them in or they will lose something as well as yourself.

As to the city of Indianapolis. Indianapolis has a friendly feeling toward you, I am sure. There is no feeling, so far as the city of Indianapolis is concerned, or so far as its business people are concerned, against the State Board of Agriculture. I have been in the trade and the

commerce of Indianapolis and I know. The people of the city of Indianapolis have on different occasions expressed a desire that they might have an opportunity to do more than they have been doing.

We have three principal boards here, the Board of Trade, the Commercial Club and the State institution which is known as the State Board of Commerce. These three institutions lead in all great business transactions of the city, and the State Board of Commerce in the leading transactions of the State. Members should be called in from these boards to make up a committee who will take charge of the assistance to be extended.

Of course you meet here as a delegate board; you meet for the purpose of electing delegates. We all know how it is about the election of the members of the State Board. They are elected by the delegate boards, and of course they have not time to investigate as to the character. You want to engage largely and make a display in manufactured articles and in things that do not belong directly in the line of farming. Of course it would be better to have a man who is identified with those interests as a representative of the city of Indianapolis. I know and you know that the State Board is criticised here and there, and that statements are made with regard to it that are not true; but it does seem to me that you should extend in the broadest manner you can an invitation to those boards to take part with you and to help conduct the business and make it a success. Whatever is required of the city of Indianapolis by you will be done. Whatever you ask that is within their power to accomplish the city of Indianapolis stands ready to accomplish.

Don't you see that if it is possible for you to hold out to them the prospect of a two-weeks' fair, they would be less intelligent than I take them to be if they would not take hold and say, "This is a matter of importance to us and we will help make every day of the fair a success." I do not think there is any reason why the city of Indianapolis should not come up and take her leading and great part in this business. I believe that every exhibitor of live stock, farm produce or manufactures who understood that they could be there for two weeks would come, and that you would double your exhibits from the start, for the reason that a great deal more time is given them to make the exhibit. At the present men having hogs or cattle or things of that kind to dispose of have to keep them there during the week. There is no comfort or ease in handling them, but you could give him a certain time during the last week if he wished it.

I would like to see the city of Indianapolis take a more active part. I believe that her organizations have been awake to everything that has been brought before them. I have discovered that where Indiana in any department of industry or branch of business has put her shoulder to the wheel, and she has undertaken to perform any work, she has not failed to place herself in the lead of all her sister States around her. There is

no reason why our State Fair should not occupy the very central place of all the States surrounding us. I believe we should have an assembly hall at the State Fair. You could even hold your industrial meetings there, and give a day to each one, and that would be a very marked advantage over the way in which the meetings are being held here and now.

I have simply opened this subject for discussion, and will now leave the matter with you.

Mortimer Levering, Lafayette: Judge Martindale is perfectly right about the matter of transportation. I think that is the principal reason why our attendance is not double what it is. The people who come here and who usually spend the most money will not submit to be jammed into the street cars in the manner they have been in the past. People do not like to stand out here in the sun on the corners of your streets twenty minutes waiting for a car, and then find it so crowded that they have barely standing room. They will stand it once or twice, but they will not come oftener, and your fair will suffer. When a convention is held here the whole city makes an effort to entertain them. Committees are sent to the depots to meet them and conduct them to the hotels, and everything is done for their comfort. How was it when the bicycle people came here to hold their convention? You raised \$20,000 to entertain them, and spent \$5,000 in wiring the monument for electrical displays and placing the word "Welcome" on it. That association did not bring to the city more than 1,500 delegates, and yet all this money was spent in entertaining them. We bring many times that number here in one day, and yet we do not see the monument illuminated with a \$5,000 design, nor do we see committees at the station to look after the comfort of the visitors.

Every citizen of Indianapolis ought to see that the people are protected. If they see a dozen women from out of town, women who are unfamiliar with the city, standing on the street corner waiting for a car, and when it does come along and they are jammed into it and compelled to hang on to a strap all the way out to the Fair Grounds, that man, if he is a public-spirited citizen of Indiana, ought to say, "We will not have that next year. These

people come here and spend their money, and we will see that they are treated properly." You will do it for a convention; you will be down there at the station with committees to meet them and look after their comfort and pay attention to them. You will not let those people stand on the streets and wait for transportation.

If people come to Lafayette we give them free transportation out to the University, the Soldiers' Home and the parks. If we could get such a number to go to Lafayette as the State Fair brings here, the business men of Lafayette would agree to pay ten cents for every person who comes there, and take them free to the State Fair Grounds. I venture to say the people would rise up in arms if they saw the people of Indianapolis standing on their street corners in the rain waiting for transportation, if they should visit Lafayette. When the street cars of our city broke down on the Fourth of July when the visitors were all out at the Soldiers' Home the people got out every conveyance in the city, public and private, and brought the people down to the city free. The State Fair has brought 60,000 people here in a day, and every person who came here spent money in the city. There is not a woman who comes here who does not expect to do some shopping, not a man who will not spend at least ten dollars.

Now we have a right to expect adequate transportation for these people, and we expect the citizens of Indianapolis to assist us in getting it. We have done the best we could; now we expect Indianapolis to assist us.

REPORT OF COMMITTEE ON PRESIDENT'S ADDRESS.

To the President and Members of the Delegate Board of Agriculture:

Your committee, to whom was referred the address of President W. W. Stevens, has carefully considered the same, and find it sound in argument and an able presentation of the work of the State Board of Agriculture.

We concur in all of the President's recommendations, and we would especially emphasize recommendation No. 6, which recommends that a committee be appointed to memorialize the Legislature to purchase the eighty acres of land needed for holding the Fairs, that is now held by lease.

Signed: AARON JONES,
JESSE STEVENS,
ROBERT MITCHELL,
N. B. WAUGH.

REPORT OF AUDITING COMMITTEE.

Mr. Aaron Jones, Chairman—Your committee has carefully compared the vouchers now on file with the books and the reports of the various officers, and find the same correct.

Your committee take great pleasure in reporting that in accordance with the order of the Delegate Board made last year, and on the order of the State Board proper that a full set of books be ordered, setting out in detail every item of receipts and expenditures fully classified. These books have been prepared and opened, and it is with great pleasure that your committee find that every item is set out and the books are correct.

The Committee on Credentials made the following report:

We, the Committee on Credentials, beg leave to make the following report as to representation at this meeting:

1. Angola Fair, Harmon L. Hutson, Indianapolis, Ind.
2. Bainbridge Fair, J. W. Edwards, Bainbridge, Ind.
3. Boswell Fair, M. A. McDonald, West Lebanon, Ind.
4. Bridgeton Fair, Daniel Miller, Bridgeton, Ind.
5. Bedford Fair, Geo. W. McDaniel, Bedford, Ind.
6. Bourbon Fair, J. E. McDonald, Ligonier, Ind.
7. Brown County Fair and Agricultural Association, J. B. Craven, Cleona, Ind.
8. Columbus Fair, Chas. Remy, Columbus, Ind.
9. Corydon Fair, Jas. W. McKinster, Corydon, Ind.
10. Chrisney Fair, J. C. Haines, Lake, Ind.
11. Covington Fair, E. H. Nebeker, Covington Ind.
12. Crawfordsville Fair, W. F. Hulet, Crawfordsville, Ind.
13. Crown Point Fair, Joseph A. Beattie, Crown Point, Ind.
14. Evansville Fair, M. A. McDonald, West Lebanon, Ind.
15. Elwood Fair, F. E. DeHORITY, Elwood, Ind.
16. Fairmount Fair, Wilbur Lucas, Fairmount, Ind.
17. Franklin Fair, B. P. Brown, Franklin, Ind.
18. Greenfield Fair, W. A. Justice, Eden, Ind.
19. Hagerstown Fair, Knobe Porter, Hagerstown, Ind.
20. Kentland Fair, H. A. Strohm, Kentland, Ind.
21. Kendallville Fair, D. K. Hitchcock, Brimfield, Ind.
22. Logansport Driving Club, Cott Barnett, Logansport, Ind.
23. Lawrenceburg Fair, H. L. Nowlin, Lawrenceburg, Ind.
24. Lebanon Fair, Riley Hauser, Lebanon, Ind.
25. Lafayette Fair, Mortimer Levering, Lafayette, Ind.
26. Laporte Fair, R. F. Small, Westville, Ind.
27. Marengo Fair, J. W. Bird, Marengo, Ind.
28. Middletown Fair, F. A. Balsar, Middletown, Ind.

29. Muncie Fair, M. S. Claypool, Muncie, Ind.
30. Marion Fair, J. L. Bradford, Marion, Ind.
31. North Vernon Fair, F. H. Nauer, North Vernon, Ind.
32. New Castle Fair, Dr. R. A. Smith, Greensboro, Ind.
33. Newtown Fair, John H. Gray, Newtown, Ind.
34. New Carlisle Fair, A. H. Compton, New Carlisle, Ind.
35. Oakland City Fair, W. R. Harris, Oakland City, Ind.
36. Portland Fair L. L. Gilpin, Portland, Ind.
37. Princeton Fair, Robert Mitchell, Princeton, Ind.
38. Rushville Fair, R. N. Hinchman, Rushville, Ind.
39. Riley Fair, W. T. Beauchamp, Terre Haute, Ind.
40. Morocco Fair, C. M. Hauger, Morocco, Ind.
41. Richmond Fair, Jesse Stevens, Richmond, Ind.
42. Rochester Fair, N. A. McClung, Rochester, Ind.
43. Tipton Fair, Jas. Ryan, Tipton, Ind.
44. Swayzee Fair, Wm. Hartley, Point Isabel, Ind.
45. Sheridan Fair, Calvin Sturdevant, Noblesville, Ind.
46. Shelbyville Fair, Sid Conger, Flat Rock, Ind.
47. Salem Fair, H. C. Hobbs, Salem, Ind.
48. Terre Haute Fair, W. T. Beauchamp, Terre Haute, Ind.
49. Vincennes Fair, J. D. Williams, Vincennes, Ind.
50. Winchester Fair, Alva C. Green, Winchester, Ind.
51. Vermillion Fair, M. A. McDonald, West Lebanon, Ind.
52. Noble County Horticultural Society, J. W. Moorehouse, Albion, Ind.
53. Monroe County Horticultural and Agricultural Society, Geo. P. Campbell, Bloomington, Ind.
54. Bloomington Fair, C. R. Worrall, Bloomington, Ind.
55. Cass County Horticultural Society, L. B. Custer, Logansport, Ind.
56. Huntingburg Fair, E. W. Pickhardt, Huntingburg, Ind.
57. Marlon Horticultural Society, Sylvester Johnson, Irvington, Ind.
58. Johnson County Horticultural Society, John Tilson, Franklin, Ind.
59. Lagrange County Agricultural and Horticultural Society, J. C. Grossman.
60. Western Indiana Race Track and Fair Association, M. A. McDonald, West Lebanon, Ind.
61. Floyd County Trotting and Fair Association, H. C. Hobbs, Salem, Ind.
62. St. Joseph County Horticultural Society, H. H. Swain, South Bend, Ind.
63. St. Joseph County Agricultural Society, Aaron Jones, South Bend, Ind.
64. Union County Agricultural and Horticultural Society, H. F. McMahan, Liberty, Ind.

- 65. Frankfort Fair, J. A. Hedgecock, Frankfort, Ind.
- 66. Plainfield Horticultural and Agricultural Society, John Morgan, Plainfield, Ind.
- 67. Wayne County Horticultural Society, J. C. Ratcliffe, Richmond, Ind.

Respectfully submitted,

H. L. NOWLIN,
JOHN TILSON,
CALVIN STURDEVANT,
Committee on Credentials.

Motion made and seconded that the report be accepted.

Motion carried.

Motion made and seconded that Mr. C. Thomas, representing Grant County Horticultural Society, be added to the list of voting delegates.

Motion laid on table.

Motion made and seconded that the representative of the Bourbon County Fair be allowed to vote, as the certificate had been made out but was mislaid. Motion carried, and J. E. McDonald was named as the representative.

Mr. Jesse Stevens asked that the name of the Wayne County Agricultural and Horticultural Society be placed on the list.

Motion to this effect made and carried, and the name of J. C. Ratcliffe was placed on the list to represent this society.

Motion made and carried that the name of Mr. Johnson be substituted for that of Mr. Flick as representative of the Marion County Horticultural Society.

Mr. Hewlitt, Mr. Bridges and Mr. Williams appointed tellers for the election to be held.

ELECTION OF MEMBERS OF STATE BOARD.

First District: John C. Haines, placed in nomination by Mr. Aiken, Evansville.

Mr. J. H. Gwaltney, placed in nomination by Mr. Riley.

On the first ballot Mr. Haines received 47 votes and Mr. Gwaltney 17. Mr. Haines was declared elected.

Second District: Mason J. Niblack, placed in nomination by J. D. Williams.

James F. McCoy, placed in nomination by H. R. Tyler.

On the first ballot Mr. Niblack received 42 ballots and Mr. McCoy 22, and Mr. Niblack was declared elected.

Third District: W. W. Stevens, placed in nomination by Mr. H. F. McMahan.

No other candidate being nominated, Mr. Stevens's election was made unanimous.

Fourth District: C. A. Worrall, placed in nomination by M. A. McDonald.

E. A. Robinson, placed in nomination by John Tilson.

R. M. Brown, placed in nomination by R. E. Luyster.

On the first ballot Mr. Robinson received 33 votes, Mr. Worrall 25 votes, Mr. Brown 6 votes, and Mr. Robinson was declared elected.

Seventh District: H. B. Howland, nominated by Mortimer Levering.

John H. Pryor, nominated by ———.

On the first ballot Mr. Howland received 47 votes, Mr. Pryor 17.

Fourteenth District: Mr. Cott Barnett, nominated by Mr. Sturdevant.

Hon. Joseph Cunningham, nominated by Mr. Luyster.

On the first ballot Mr. Barnett received 35 votes and Mr. Cunningham 30 votes.

The result showed that one ballot more than the right number had been cast, so another ballot was taken.

The second ballot resulted in 35 votes for Mr. Barnett and 29 votes for Mr. Cunningham.

Fifteenth District: Hon. Aaron Jones, nominated by Jesse Stevens.

As no other candidate was placed in nomination, Mr. Jones's election was made unanimous.

Sixteenth District: James E. McDonald, placed in nomination by Mr. Kennedy.

John H. Hitchcock, placed in nomination by Mr. Moorehouse.

Calvin Husselman, placed in nomination by Mr. Billiter.

On the first ballot Mr. McDonald received 44 votes, Mr. Hitchcock 9 votes and Mr. Husselman 9 votes. Mr. McDonald was declared elected.

Meeting adjourned sine die.

INDIANA STATE FAIR, 1899.

DEPARTMENT A. SPEED.

W. T. BEAUCHAMP, Superintendent.
M. A. McDONALD, Starting Judge.

H. H. BOUDINOT, }
J. W. BROWNING, } Judges.
W. W. MORGAN, }

HORACE F. WOOD, }
W. H. DUNCAN, } Timers.

J. W. AGNEW, Clerk of Course.

AWARDS.

TUESDAY, SEPTEMBER 19.

2:30 Trot—\$500 divided—\$250.00, \$125.00, \$75.00 and \$50.00.

I. J. M., b g.....	9	5	1	1	1
Bell Thomas, g g.....	1	1	3	4	9
Phrase, b m.....	2	8	5	2	2
Ebba, g s.....	3	4	2	9	5
Klondyke, s g.....	8	2	4	8	4
Annie Burns, g m.....	4	3	11	5	3
Corrine, b m.....	5	7	7	3	7
Mary C., b m.....	7	6	8	11	6
May Monday, b m.....	6	9	6	6	10
Red Arthur, b h.....	10	10	9	7	8
Lady K., b m.....	11	11	10	10	11

	TIME.			
	¼ Mile.	½ Mile.	¾ Mile.	Mile.
First heat	:35¾	1:11	1:46	2:20
Second heat	:36	1:12	1:46½	2:21½
Third heat	:36	1:11	1:46	2:20
Fourth heat	:36½	1:11½	1:46	2:19½
Fifth heat	:36	1:11	1:45	2:20

2:09 Pace—\$800 divided—\$400.00, \$200.00, \$120.00 and \$80.00.

Nichol B., b s.....	8	1	1	10	1
Exploit, b s.....	6	2	5	1	3
Free Bond, b g.....	1	4	9	13	9
Split Silk, c m.....	14	2	2	2	7
Oddity, c s.....	2	5	3	5	2
Birchtwig, bl g.....	13	14	14	3	4
Milton S., b s.....	5	8	4	4	10
Atlantic King, bl s.....	4	10	6	12	13
Ding, b m.....	7	7	10	11	5
Jersey Mack, b g.....	11	6	8	6	8
Waymark	10	13	13	8	6
Auntie Shucks, b m.....	12	11	7	9	11
Red Seal, b s.....	9	12	12	7	12
Minnehaha, b m.....	3	9	11	Dr.	

	TIME.			
	¼ Mile.	½ Mile.	¾ Mile.	Mile.
First heat	:33	1:05	1:37	2:10¾
Second heat	:32½	1:05	1:37½	2:10
Third heat	:33	1:06	1:39	2:11
Fourth heat	:33½	1:06	1:38½	2:11½
Fifth heat	:34	1:06	1:40	2:13

2:20 Trot—\$600 divided—\$300.00, \$150.00, \$90.00, \$60.00.

Bertha Lee, bl m.....	1	1	7	1
Sadie M., br m.....	6	2	1	5
Palm Leaf, b g.....	2	3	3	2
Mexican Boy	3	6	2	4
Judge Wiley, b s.....	11	12	10	3
Miss Dean, b m.....	4	5	4	6
Orphan Girl, s m.....	7	4	6	7
Baron Belt	9	7	5	8
Lila Sprague, br m.....	5	8	8	Dr.
Baby C., b m.....	8	10	9	Dr.
May Bell, bl m.....	12	9	Dr.	
Allen F., b s.....	10	11	Dr.	

TIME.

	$\frac{1}{4}$ Mile.	$\frac{1}{2}$ Mile.	$\frac{3}{4}$ Mile.	Mile.
First heat	:34	1:08	1:41 $\frac{1}{2}$	2:15
Second heat	:35	1:08	1:40 $\frac{1}{2}$	2:15
Third heat	:33	1:07	1:40	2:14
Fourth heat	:32	1:06	1:38 $\frac{1}{2}$	2:13 $\frac{1}{2}$

WEDNESDAY, SEPTEMBER 20.

2:25 Pace—\$500 divided—\$250.00, \$125.00, \$75.00 and \$50.00.

Hetty G., b m.....	1	1	1	.
Slumber, Jr., b s.....	2	2	7	
Will Davis, b s.....	3	4	2	
Beauty Spot, b m.....	8	3	3	
Jack Pointer, r s.....	6	5	4	
Eapherham, b g.....	4	9	8	
Gamehurst, b s.....	9	6	5	
Plumline, b m.....	5	8	9	
W. C., d g.....	10	7	6	
Nola Appleton, b m.....	7	10	Dr.	

TIME.

	$\frac{1}{4}$ Mile.	$\frac{1}{2}$ Mile.	$\frac{3}{4}$ Mile.	Mile.
First heat	:33 $\frac{1}{2}$	1:07 $\frac{1}{2}$	1:42	2:16 $\frac{3}{4}$
Second heat	:34 $\frac{1}{2}$	1:08	1:41	2:16
Third heat	:33	1:07	1:41	2:15

2:10 Trot—\$800 divided—\$400.00, \$200.00, \$120.00 and \$80.00.

Bonnatella, b m.....	2	1	1	1
Dr. Leek, c g.....	1	6	8	2
Ellert, b g.....	6	9	2	3
Sir Charles, b s.....	5	3	3	4
Russellwood, b s.....	8	4	6	6
Miss Sligo, b m.....	9	7	4	5
Wyruma, b m.....	7	5	9	7
Caracalla, br m.....	4	8	5	Dr.
Sarah S., b m.....	3	2	7	Dis.

TIME.

	$\frac{1}{4}$ Mile.	$\frac{1}{2}$ Mile.	$\frac{3}{4}$ Mile.	Mile.
First heat	:32	1:04	1:36 $\frac{1}{2}$	2:09 $\frac{1}{2}$
Second heat	:33	1:05	1:37	2:10
Third heat	:33	1:06 $\frac{1}{2}$	1:40	2:12
Fourth heat	:32 $\frac{1}{2}$	1:06	1:38 $\frac{1}{4}$	2:10 $\frac{1}{2}$

2:17 Pace—\$600 divided—\$300.00, \$150.00, \$90.00 and \$60.00.

Princess Dora, bl m.....	1	1	1
Jim Rainey, c g.....	3	2	5
Lady Conway, g m.....	2	3	9
Violation, b m.....	4	5	2
Ladoga Boy, g g.....	8	6	3
Little Dock, b s.....	7	8	4
Birdy McCoy, b m.....	9	4	7
Surprise, b m.....	5	7	6
Douglass Mald b m.....	6	9	8

TIME.

	¼ Mile.	½ Mile.	¾ Mile.	Mile.
First heat	:32	1:05	1:38	2:11½
Second heat	:31¾	1:05	1:38¾	2:11½
Third heat	:32¼	1:06¼	1:40½	2:16

THURSDAY, SEPTEMBER 21.

2:14 Pace—\$600 divided—\$300.00, \$150.00 \$90.00 and \$60.00.

Scape Goat, b g.....	1	1	1
Edgar H., b g.....	3	2	4
Hester Russell, r m.....	2	3	5
Roundwood, b s.....	4	4	2
Victor Little, c g.....	7	5	3
Light Star, c g.....	5	7	6
Marshall, b g.....	8	6	Dis.
Ruby Mack, g m.....	6	Dis.	
Walnut Lad, br g.....	9	Dis.	

TIME.

	¼ Mile.	½ Mile.	¾ Mile.	Mile.
First heat	:32	1:06	1:38	2:11½
Second heat	:32	1:05	1:38	2:11½
Third heat	:32½	1:05	1:38½	2:12¼

2:25 Trot—\$500 divided—\$250.00, \$125.00, \$75.00 and \$50.00.

Baronwood, br g.....	9	1	1	1
Kelmont b g.....	2	6	9	3
Zenda, c s.....	7	2	5	6
Ruthford, b g.....	8	8	2	7
Lord Linton, c s.....	10	10	7	2

ANNUAL MEETING.

77

Winwood, b g.....	3	3	6	9
Eunice, b m.....	4	4	3	4
St. Illario	5	5	4	5
Frost Wilkes, b g.....	6	7	10	8
Richmond, b g.....	12	9	8	Dr.
Albert Lewis, b g.....	11	Dis.		
Albert Powell, b g.....	1	Dr.		
J. W. C., b g.....		Dis.		

TIME.

	¼ Mile.	½ Mile.	¾ Mile.	Mile.
First heat	:33½	1:08¼	1:43	2:18¼
Second heat	:34½	1:09	1:43½	2:16¼
Third heat	:34	1:08¾	1:42¾	2:18
Fourth heat	:35	1:09½	1:43½	2:18

Free-for-all Pace—\$800 divided—\$400.00, \$200.00, \$120.00 and \$80.00.

Indiana, b g.....	1	1	1
Don Q., b s.....	3	2	2
Tom Ogden, b g.....	2	4	3
Giles Noyes, b g.....	4	5	4
Anannias, b s.....	5	3	Dis.

TIME.

	¼ Mile.	½ Mile.	¾ Mile.	Mile.
First heat	:30	1:02½	1:34½	2:06
Second heat	:31½	1:04	1:36	2:07
Third heat.....	:32	1:04	1:37	2:08¾

FRIDAY, SEPTEMBER 22.

2:15 Trot—\$600 divided—\$300.00, \$150.00, \$90.00 and \$60.00.

Cutting, b s.....	1	3	1	2	1
Guy, c s.....	8	1	2	6	7
Pero Belle, b m.....	11	9	9	1	3
Starmont	10	2	8	4	2
Aggie Medium, b m.....	2	6	3	3	4
Helrs Medium, b m.....	3	7	6	9	5
Gunsaulus	6	5	4	6	5
Gold Standard	5	4	5	10	9
Maldino, b m.....	7	8	7	8	8
Edwin B., b g.....	4	10	10	7	Dis.
Stella S., b m.....	9	11	Dr.		

	TIME.			
	¼ Mile.	½ Mile.	¾ Mile.	Mile.
First heat	:32½	1:06¾	1:39½	2:13¾
Second heat	:32	1:05	1:39	2:12½
Third heat	:33	1:06¾	1:39½	2:12¼
Fourth heat	:32¼	1:04¾	1:38½	2:12¼
Fifth heat	:33¼	1:07	1:41	2:14½

2:21 Pace—\$500 divided—\$250.00, \$125.00, \$75.00 and \$50.00.

Hetty G., b m.....	1	1	1
Sam Medium, b s.....	10	2	2
Abbott Hill, c g.....	7	3	3
Merry-go-Round, b g.....	3	6	6
Billy George, c g.....	4	4	5
Baron B., b s.....	11	7	4
Gus Hornet, br g.....	8	5	7
Arthur W	5	11	10
Gloria, c m.....	6	8	8
Tommy G., b s.....	9	10	9
Alice J., b m.....	2	9	Dr.

	TIME.			
	¼ Mile.	½ Mile.	¾ Mile.	Mile.
First heat	:32½	1:05	1:37¾	2:12
Second heat	:32	1:04½	1:38¼	2:14
Third heat	:32½	1:06	1:39½	2:13¼

Free-for-all Trot—\$800 divided—\$400.00, \$200.00, \$120.00 and \$80.00.

Cresceus	1	1
John Nolan	2	2

	TIME.			
	¼ Mile.	½ Mile.	¾ Mile.	Mile.
First heat	:32	1:04¾	1:37¾	2:09
Second heat	:33½	1:06	1:39¾	2:10½

DEPARTMENT B. HORSES.

CLASS I—French Draft and Percheron Horses.

(R. P. Stericker, Judge, Janesville, Wis.)

STALLIONS.

4 years old and over, Robert Burgess & Son, Wenona, Ill.....	\$20 00
Second premium, Robert Burgess & Son, Wenona, Ill.....	12 00
Third premium, Robert Burgess & Son, Wenona, Ill.....	7 00
3 to 4 years old, L. W. Cochran, Crawfordsville, Ind.....	15 00
Second premium, Robert Burgess & Son, Wenona, Ill.....	10 00
Third premium, Robert Burgess & Son, Wenona, Ill.....	6 00
2 to 3 years old, Robert Burgess & Son, Wenona, Ill.....	12 00
Second premium, Robert Burgess & Son, Wenona, Ill.....	8 00
Third premium, L. W. Cochran, Crawfordsville, Ind.....	5 00
1 to 2 years old, Robert Burgess & Son, Wenona, Ill.....	10 00
Second premium, Robert Burgess & Son, Wenona, Ill.....	6 00
Third premium, Robert Burgess & Son, Wenona, Ill.....	4 00
Colt, Robert Burgess & Son, Wenona, Ill.....	8 00
Stallion showing four colts, Robert Burgess & Son, Wenona, Ill...	20 00

MARES AND FILLIES.

4 years old and over, Robert Burgess & Son, Wenona, Ill.....	20 00
3 to 4 years old, Robert Burgess & Son, Wenona, Ill.....	15 00
Second premium, Robert Burgess & Son, Wenona, Ill.....	10 00
1 to 2 years old, Robert Burgess & Son, Wenona, Ill.....	10 00

CLASS II—Clydesdale and English Shires.

(R. P. Stericker, Judge, Janesville, Wis.)

STALLIONS.

4 years old and over, Robert Burgess & Son, Wenona, Ill.....	\$20 00
Second premium, Robert Burgess & Son, Wenona, Ill.....	12 00
3 to 4 years old, Robert Burgess & Son, Wenona, Ill.....	15 00
Second premium, A. C. Turner, Ross, O.....	10 00
2 to 3 years old, Robert Burgess & Son, Wenona, Ill.....	12 00
Second premium, L. W. Cochran, Crawfordsville, Ind.....	8 00

Third premium, Robert Burgess & Son, Wenona, Ill.....	5 00
1 to 2 years old, L. W. Cochran, Crawfordsville, Ind.....	10 00
Second premium, Robert Burgess & Son, Wenona, Ill.....	6 00
Colt, L. W. Cochran, Crawfordsville, Ind.....	8 00
Stallion and four colts, Robert Burgess & Son, Wenona, Ill.....	20 00
Second premium, L. W. Cochran, Crawfordsville, Ind.....	15 00

MARES AND FILLIES.

4 years old and over, Robert Burgess & Son, Wenona, Ill.....	20 00
Second premium, L. W. Cochran, Crawfordsville, Ind.....	12 00
Third premium, Rosco Sears, Indianapolis, Ind.....	7 00
3 to 4 years old, L. W. Cochran, Crawfordsville, Ind.....	15 00
Filly under 1 year, L. W. Cochran, Crawfordsville, Ind.....	8 00

CLASS III—French and German Coach.

(R. P. Stericker, Judge, Janesville, Wis.)

STALLIONS.

4 years old and over, Lafayette Importing Co., Lafayette, Ind.....	\$20 00
Second premium, J. Crouch & Son, Lafayette, Ind.....	12 00
Third premium, L. W. Cochran, Crawfordsville, Ind.....	7 00
3 to 4 years old, J. Crouch & Son, Lafayette, Ind.....	15 00
Second premium, J. Crouch & Son, Lafayette, Ind.....	10 00
Third premium, Lafayette Importing Co., Lafayette, Ind.....	6 00
2 to 3 years old, Lafayette Importing Co., Lafayette, Ind.....	12 00
Second premium, J. Crouch & Son, Lafayette, Ind.....	8 00
Third premium, Lafayette Importing Co., Lafayette, Ind.....	5 00
1 to 2 years old, L. W. Cochran, Crawfordsville, Ind.....	10 00
Stallion and four colts, Lafayette Importing Co., Lafayette, Ind...	20 00

MARES AND FILLIES.

4 years old and over, J. Crouch & Son, Lafayette, Ind.....	20 00
3 to 4 years old, J. Crouch & Son, Lafayette, Ind.....	15 00
1 to 2 years old, J. Crouch & Son, Lafayette, Ind.....	10 00

CLASS IV—Cleveland Bay, Hackney and American Coach.

(R. P. Stericker, Judge, Janesville, Wis.)

STALLIONS.

4 years old and over, J. Crouch & Son, Lafayette, Ind.....	\$20 00
Second premium, S. R. Davis, North Salem, Ind.....	12 00

Third premium, A. C. Turner, Ross, O.....	7 00
3 to 4 years old, J. Crouch & Son, Lafayette, Ind.....	15 00
Second premium, A. C. Turner, Ross, O.....	10 00
Third premium, Ira S. Doggett, Downeyville, Ind.....	6 00
2 to 3 years old, Robert Burgess & Son, Wenona, Ill.....	12 00
1 to 2 years old, Robert Burgess & Son, Wenona, Ill.....	10 00
Second premium, A. C. Turner, Ross, O.....	6 00
Stallion and four colts, J. R. Peak & Son, Winchester, Ill.....	20 00
Second premium, A. C. Turner, Ross, O.....	15 00

MARES AND FILLIES.

4 years and over, John V. Connolly, Madison, Ind.....	20 00
Second premium, J. R. Peak & Son, Winchester, Ill.....	12 00
Third premium, Ira S. Doggett, Downeyville, Ind.....	7 00
3 to 4 years old, J. R. Peak & Son, Winchester, Ill.....	15 00
Second premium, J. R. Peak & Son, Winchester, Ill.....	10 00
Third premium, Ira S. Doggett, Downeyville, Ind.....	6 00
2 to 3 years old, J. R. Peak & Son, Winchester, Ill.....	12 00
Second premium, A. C. Turner, Ross, O.....	5 00
1 to 2 years old, J. R. Peak & Son, Winchester, Ill.....	10 00

CLASS V—Light Harness.

(R. P. Stericker, Judge, Janesville, Wis.)

STALLIONS.

4 years old and over, J. R. Peak & Son, Winchester, Ill.....	\$20 00
Second premium, John V. Connolly, Madison, Ind.....	12 00
Third premium, A. C. Turner, Ross, O.....	7 00
3 to 4 years old, A. C. Turner, Ross, O.....	15 00
Second premium, J. R. Peak & Son, Winchester, Ill.....	10 00
Third premium, Ira S. Doggett, Downeyville, Ind.....	6 00
2 to 3 years old, Ira S. Doggett, Downeyville, Ind.....	12 00
Second premium, J. B. Clawson, Indianapolis, Ind.....	8 00
1 to 2 years old, Ira S. Doggett, Downeyville, Ind.....	10 00
Second premium, A. C. Turner, Ross, O.....	6 00
Third premium, H. B. Howland, Howland, Ind.....	4 00
Colt, J. R. Peak & Son, Winchester, Ill.....	8 00
Second premium, John Morgan, Plainfield, Ind.....	5 00
Third premium, A. C. Turner, Ross, O.....	3 00
Stallion and four colts, J. R. Peak & Son, Winchester, Ill.....	20 00
Second premium, William Dagler, Rushville, Ind.....	15 00
Third premium, John V. Connolly, Madison, Ind.....	10 00

MARES AND FILLIES.

4 years old and over, J. R. Peak & Son, Winchester, Ill.....	20 00
Second premium, George W. Koehne, Indianapolis, Ind.....	12 00
Third premium, D. J. Brien, Indianapolis, Ind.....	7 00
3 to 4 years old, Thos. Harris, Anderson, Ind.....	15 00
Second premium, J. R. Peak & Son, Winchester, Ill.....	10 00
Third premium, J. R. Peak & Son, Winchester, Ill.....	6 00
2 to 3 years old, J. R. Peak & Son, Winchester, Ill.....	12 00
Second premium, A. C. Turner, Ross, O.....	8 00
Third premium, H. B. Howland, Howlands, Ind.....	5 00
1 to 2 years old, J. R. Peak & Son, Winchester, Ill.....	10 00
Second premium, H. B. Howland, Howlands, Ind.....	6 00
Third premium, John Milton, Marshall, Mich.....	4 00
Filly under 1 year old, John Morgan, Plainfield, Ind.....	8 00
Second premium, John Morgan, Plainfield, Ind.....	5 00
Mare and two colts, J. R. Peak & Son, Winchester, Ill.....	20 00
Second premium, A. C. Turner, Ross, O.....	15 00
Third premium, William Dagler, Rushville, Ind.....	10 00

GELDINGS.

4 years old and over, Joyer & Gentry, Princeton, Ind.....	20 00
Second premium, William W. Baker, Indianapolis, Ind.....	12 00
Third premium, H. H. Gates, Indianapolis, Ind.....	7 00
3 to 4 years old, Robert Longfellow, Ging, Rush County, Ind.....	15 00
Second premium, H. B. Howland, Howlands, Ind.....	10 00
Third premium, H. E. Sebern, Indianapolis, Ind.....	6 00
2 to 3 years old, William Dagler, Rushville, Ind.....	12 00

CLASS VI—Coach and Carriage Teams, Roadsters and Saddlers.

(R. P. Stericker, Judge, Janesville, Wis.)

Coach or carriage team, W. T. Beck, Crawfordsville, Ind.....	\$30 00
Second premium, A. Schicktan, Indianapolis, Ind.....	20 00
Third premium, J. R. Peak & Son, Winchester, Ill.....	10 00
Single roadster (mare), J. R. Peak & Son, Winchester, Ill.....	30 00
Second premium, D. J. Brien, Indianapolis, Ind.....	20 00
Third premium, George W. Koehne, Indianapolis, Ind.....	10 00
Single Roadster (gelding), Joyer & Gentry, Princeton, Ind.....	30 00
Second premium, J. R. Peak & Son, Winchester, Ill.....	20 00
Third premium, H. H. Gates, Indianapolis, Ind.....	10 00
Double roadster, J. R. Peak & Son, Winchester, Ill.....	30 00

Second premium, J. Crouch & Son, Lafayette, Ind.....	20 00
Third premium, John V. Connolly, Madison, Ind.....	10 00
Saddle stallion, John V. Connolly, Madison, Ind.....	30 00
Second premium, T. C. Ruble, Franklin, Ind.....	20 00
Third premium, Massey Bros., Owensville, Ind.....	10 00
Saddle mare, Henry Taylor, Richmond, Ind.....	30 00
Second premium, Charles C. Judy, Tallula, Ill.....	20 00
Third premium, John V. Connolly, Madison, Ind.....	10 00
Saddle gelding, Charles C. Judy, Tallula, Ill.....	30 00
Second premium, E. L. McCollem, Columbus, O.....	20 00
Third premium, John V. Connolly, Madison, Ind.....	10 00
Best saddle stallion, mare or gelding, Charles C. Judy, Tallula, Ill.	50 00

CLASS VII—Ponies.

(R. P. Stericker, Judge, Janesville, Wis.)

Pony, 11 hands or under, single harness, Charles S. Clancy, Indianapolis, Ind.....	\$10 00
Second premium, E. M. Brouse, Indianapolis, Ind.....	5 00
Pony, 11 to 13 hands, Hilda Fletcher, Indianapolis, Ind.....	10 00
Second premium, George Ransdall, Indianapolis, Ind.....	5 00
Pony, 11 to 14½ hands, Chester A. Baker, Indianapolis.....	10 00
Mare and colt, E. M. Brouse, Indianapolis, Ind.....	10 00
Pair of ponies, 11 to 13 hands, in harness, E. M. Brouse, Indianapolis, Ind.....	10 00
Ponies, tandem, E. M. Brouse, Indianapolis, Ind.....	10 00

CLASS VIII—Equipages.

(R. P. Stericker, Judge, Janesville, Wis.)

Two-horse, two-seated, H. H. Gates, Indianapolis, Ind.....	\$20 00
Second premium, John V. Connolly, Madison, Ind.....	15 00
One-horse, one-seated, for lady, Mrs. H. H. Gates, Indianapolis, Ind.	15 00
Second premium, George W. Koehne, Indianapolis, Ind.....	12 00
Vehicle for children, Hilda Fletcher, Indianapolis, Ind.....	15 00
Second premium, E. M. Brouse, Indianapolis, Ind.....	12 00
Third premium, Chester A. Baker, Indianapolis, Ind.....	7 00

DEPARTMENT C. CATTLE. (BEEF BREEDS.)

CLASS IX—Short Horns and Polled Durhams.

(David McKay, Judge, Ft. Wayne, Ind.)

BULLS.

3 years old or over, J. D. Douglass & Son, Shelbyville, Ind.....	\$15 00
Second premium, W. A. Boland, Grass Lake, Mich.....	10 00
Third premium, C. F. Rice, Indianola, Ill.....	5 00
2 to 3 years old, J. G. Robbins & Sons, Horace, Ind.....	10 00
1 to 2 years old, W. A. Boland, Grass Lake, Mich.....	8 00
Second premium, J. G. Robbins & Sons, Horace, Ind.....	6 00
Third premium, Joseph Witter, College Corner, O.....	3 00
Calf, J. D. Douglass & Son, Shelbyville, Ind.....	5 00
Second premium, Joseph Witter, College Corner, O.....	3 00
Third premium, C. F. Rice, Indianola, Ill.....	2 00

COWS AND HEIFERS.

3 years old and over, Joseph Witter, College Corner, O.....	15 00
Second premium, J. D. Douglass & Son, Shelbyville, Ind.....	10 00
Third premium, W. A. Boland, Grass Lake, Mich.....	5 00
2 to 3 years old, W. A. Boland, Grass Lake, Mich.....	10 00
Second premium, C. F. Rice, Indianola, Ill.....	7 00
Third premium, J. G. Robbins & Sons, Horace, Ind.....	4 00
1 to 2 years old, W. A. Boland, Grass Lake, Mich.....	8 00
Second premium, W. A. Boland, Grass Lake, Mich.....	6 00
Third premium, J. G. Robbins & Sons, Horace, Ind.....	3 00
Calf, J. G. Robbins & Sons, Horace, Ind.....	5 00
Second premium, J. G. Robbins & Sons, Horace, Ind.....	3 00
Third premium, W. A. Boland, Grass Lake, Mich.....	2 00
Four animals, get of one sire, J. G. Robbins & Sons, Horace, Ind..	10 00
Second premium, W. A. Boland, Grass Lake, Mich.....	7 00
Third premium, C. F. Rice, Indianola, Ill.....	4 00
Two animals, produce of one cow, W. A. Boland, Grass Lake, Mich.	10 00
Second premium, J. D. Douglass & Son, Shelbyville, Ind.....	7 00
Third premium, C. F. Rice, Indianola, Ill.....	4 00
Exhibitors' herd, W. A. Boland, Grass Lake, Mich.....	20 00
Second premium, J. D. Douglass & Son, Shelbyville, Ind.....	10 00
Breeders' herd, J. G. Robbins & Sons, Horace, Ind.....	20 00
Bull, any age, W. A. Boland, Grass Lake Mich.....	20 00
Cow or heifer, any age, W. A. Boland, Grass Lake, Mich.....	20 00

CLASS X—Herefords.

(David McKay, Judge, Ft. Wayne, Ind.)

BULLS.

Three years old or over, F. A. Nave, Attica, Ind.....	\$15 00
2 to 3 years old, John Hooker, New London, O.....	10 00
Second premium, Clem Graves, Bunker Hill, Ind.....	7 00
1 to 2 years old, John Hooker, New London, Ohio.....	8 00
Second premium, F. A. Nave, Attica, Ind.....	6 00
Third premium, Clem Graves, Bunker Hill, Ind.....	3 00
Calf, F. A. Nave, Attica, Ind.....	5 00
Second premium, F. A. Nave, Attica, Ind.....	3 00
Third premium, John Hooker, New London, Ohio.....	2 00

COWS AND HEIFERS.

3 years old or over, F. A. Nave, Attica, Ind.....	15 00
Second premium, John Hooker, New London, Ohio.....	10 00
Third premium, John Hooker, New London, Ohio.....	5 00
2 to 3 years old, John Hooker, New London, Ohio.....	10 00
Second Premium, F. A. Nave, Attica, Ind.....	7 00
Third premium, John Hooker, New London, Ohio.....	4 00
1 to 2 years old, F. A. Nave, Attica, Ind.....	8 00
Second premium, John Hooker, New London, Ohio.....	6 00
Third premium, Clem Graves, Bunker Hill, Ind.....	3 00
Calf, John Hooker, New London, Ohio.....	5 00
Second premium, F. A. Nave, Attica, Ind.....	3 00
Third premium, John Hooker, New London, Ohio.....	2 00
Four animals, get of one sire, F. A. Nave, Attica, Ind.....	10 00
Second premium, John Hooker, New London, Ohio.....	7 00
Third premium, Clem Graves, Bunker Hill, Ind.....	4 00
Two animals, produce of one cow, John Hooker, New London, Ohio	10 00
Second premium, Clem Graves, Bunker Hill, Ind.....	7 00
Third premium, John Hooker, New London, Ohio.....	4 00
Exhibitors' herd, F. A. Nave, Attica, Ind.....	20 00
Second premium, John Hooker, New London, Ohio.....	10 00
Breeders' herd, John Hooker, New London, Ohio.....	20 00
Second premium, F. A. Nave, Attica, Ind.....	10 00
Bull, any age, F. A. Nave, Attica, Ind.....	20 00
Cow or heifer, any age, F. A. Nave, Attica, Ind.....	20 00

HEREFORD CATTLE BREEDERS' ASSOCIATION—Special Premium.

BULLS.

3 years old or over, F. A. Nave, Attica, Ind.....	\$14 00
2 to 3 years old, John Hooker, New London, Ohio.....	14 00
Second premium, Clem Graves, Bunker Hill, Ind.....	8 00
1 to 2 years old, John Hooker, New London, Ohio.....	12 00
Second premium, F. A. Nave, Attica, Ind.....	8 00
Third premium, Clem Graves, Bunker Hill, Ind.....	4 00
Calf, F. A. Nave, Attica, Ind.....	12 00
Second premium, F. A. Nave, Attica, Ind.....	8 00
Third premium, John Hooker, New London, Ohio.....	4 00
Cow, 3 years old or over, F. A. Nave, Attica, Ind.....	14 00
Second premium, John Hooker, New London, Ohio.....	8 00
Third premium, John Hooker, New London, Ohio.....	4 00
Heifer, 2 to 3 years old, John Hooker, New London, Ohio.....	14 00
Second premium, F. A. Nave, Attica, Ind.....	8 00
Third premium John Hooker New London, Ohio.....	4 00
Heifers, 1 to 2 years old, F. A. Nave, Attica, Ind.....	12 00
Second premium, John Hooker, New London, Ohio.....	8 00
Third premium, Clem Graves, Bunker Hill, Ind.....	4 00
Heifer calf, John Hooker, New London, Ohio.....	12 00
Second premium, F. A. Nave, Attica, Ind.....	8 00
Third premium, John Hooker, New London, Ohio.....	4 00

CLASS XI—Aberdeen-Angus.

(J. H. Pickerell, Judge, Springfield, Iowa.)

BULLS.

3 years old or over, D. Bradfute & Son, Cedarville, Ohio.....	\$15 00
2 to 3 years old, Crawford Coal Company, Brazil, Ind.....	10 00
1 to 2 years old, D. Bradfute & Son, Cedarville, Ohio.....	8 00
Calf, D. Bradfute & Son, Cedarville, Ohio.....	5 00
Second premium, Crawford Coal Company, Brazil, Ind.....	3 00

COWS AND HEIFERS.

3 years old or over, D. Bradfute & Son, Cedarville, Ohio.....	15 00
Second premium, Crawford Coal Company, Brazil, Ind.....	10 00
Third premium, D. Bradfute & Son, Cedarville, Ohio.....	5 00
2 to 3 years old, Crawford Coal Company, Brazil, Ind.....	10 00
Second premium, D. Bradfute & Son, Cedarville, Ohio.....	7 00
Third premium, D. Bradfute & Son, Cedarville, Ohio.....	4 00

1 to 2 years old, D. Bradfute & Son, Cedarville, Ohio.....	8 00
Second premium, D. Bradfute & Son, Cedarville, Ohio.....	6 00
Third premium, Crawford Coal Company, Brazil, Ind.....	3 00
Calf, D. Bradfute & Son, Cedarville, Ohio.....	5 00
Second premium, D. Bradfute & Son, Cedarville, Ohio.....	3 00
Third premium, Crawford Coal Company, Brazil, Ind.....	2 00
Four animals, get of one sire, D. Bradfute & Son, Cedarville, Ohio.	10 00
Second premium, D. Bradfute & Son, Cedarville, Ohio.....	7 00
Four animals, produce of one cow, D. Bradfute & Son, Cedarville, Ohio	10 00
Second premium, D. Bradfute & Son, Cedarville, Ohio.....	7 00
Exhibitor's herd, D. Bradfute & Son, Cedarville, Ohio.....	20 00
Second premium, Crawford Coal Company, Brazil, Ind.....	10 00
Breeder's herd, D. Bradfute & Son, Cedarville, Ohio.....	20 00
Bull, any age. D. Bradfute & Son, Cedarville, Ohio.....	20 00
Cow or helper, any age, D. Bradfute & Son, Cedarville, Ohio.....	20 00

CLASS XII—Galloways.

(J. H. Pickerell, Judge, Springfield, Iowa.)

BULLS.

3 years old or over, James W. Byers, London, Ohio.....	\$15 00
Second premium, Marion Parr, Cooksville, Ill.....	10 00
2 to 3 years old, T. J. Davis & Son, Triumph, Ill.....	10 00
1 to 2 years old, T. J. Davis & Son, Triumph, Ill.....	8 00
Second premium, Marion Parr, Cooksville, Ill.....	6 00
Third premium, Marion Parr, Cooksville, Ill.....	3 00
Calf, Marion Parr, Cooksville, Ill.....	5 00
Second premium, T. J. Davis & Son, Triumph, Ill.....	3 00
Third premium, James W. Byers, London, Ohio.....	2 00

COWS AND HEIFERS.

3 years or over, Marion Parr, Cooksville, Ill.....	15 00
Second premium, Marion Parr, Cooksville, Ill.....	10 00
Third premium, Marion Parr, Cooksville, Ill.....	5 00
2 to 3 years old, Marion Parr, Cooksville, Ill.....	10 00
Second premium, T. J. Davis & Son, Triumph, Ill.....	7 00
Third premium, Marion Parr, Cooksville, Ill.....	4 00
1 to 2 years old, T. J. Davis & Son, Triumph, Ill.....	8 00
Second premium, T. J. Davis & Son, Triumph, Ill.....	6 00
Third premium, Marion Parr, Cooksville, Ill.....	3 00
Calf, T. J. Davis & Son, Triumph, Ill.....	5 00

Second premium, T. J. Davis & Son, Triumph, Ill.....	3 00
Third premium, Marion Parr, Cooksville, Ill.....	2 00
Four animals, get of one sire, T. J. Davis & Son, Triumph, Ill.....	10 00
Second premium, Marion Parr, Cooksville, Ill.....	7 00
Third premium, Marion Parr, Cooksville, Ill.....	4 00
Two animals, produce of one cow, T. J. Davis & Son, Triumph, Ill.	10 00
Second premium, Marion Parr, Cooksville, Ill.....	7 00
Third premium, Marion Parr, Cooksville, Ill.....	4 00
Exhibitor's herd, T. J. Davis & Son, Triumph, Ill.....	20 00
Second premium, Marion Parr, Cooksville, Ill.....	10 00
Breeder's herd, T. J. Davis & Son, Triumph, Ill.....	20 00
Second premium, Marion Parr, Cooksville, Ill.....	10 00
Bull, any age, James W. Byers, London, Ohio.....	20 00
Cow or heifer, any age, Marion Parr, Cooksville, Ill.....	20 00

CLASS XIII—Red Polls.

(J. H. Pickerell, Judge, Springfield, Iowa.)

BULLS.

3 years old or over, Andrew Bros., Cedarville, Ohio.....	\$10 00
Second premium, S. A. Converse, Creseo, Iowa.....	5 00
1 to 2 years old, Andrew Bros., Cedarville, Ohio.....	5 00
Second premium, S. A. Converse, Creseo, Iowa.....	3 00
Calf, Andrew Bros., Cedarville, Ohio.....	5 00
Second premium, Andrew Bros., Cedarville, Ohio.....	3 00
Third premium, S. A. Converse, Creseo, Iowa.....	

COWS AND HEIFERS.

3 years old or over, Andrew Bros., Cedarville, Ohio.....	10 00
Second premium, Andrew Bros., Cedarville, Ohio.....	5 00
Third premium, S. A. Converse, Creseo, Iowa.....	
2 to 3 years old, Andrew Bros., Cedarville, Ohio.....	7 00
Second premium, Andrew Bros., Cedarville, Ohio.....	4 00
Third premium, S. A. Converse, Creseo, Iowa.....	
1 to 2 years old, Andrew Bros., Cedarville, Ohio.....	5 00
Second premium, Andrew Bros., Cedarville, Ohio.....	3 00
Third premium, S. A. Converse, Creseo, Iowa.....	
Calf, Andrew Bros., Cedarville, Ohio.....	5 00
Second premium, Andrew Bros., Cedarville, Ohio.....	5 00
Third premium, S. A. Converse, Creseo, Iowa.....	
Four animals, get of one sire, Andrew Bros., Cedarville, Ohio.....	8 00
Second premium, S. A. Converse, Creseo, Iowa.....	4 00

Third premium, Andrew Bros., Cedarville, Ohio.....	
Two animals, produce of one cow, Andrew Bros., Cedarville, Ohio.	8 00
Second premium, S. A. Converse, Creseo, Iowa.....	4 00
Third premium, Andrew Bros., Cedarville, Ohio.....	
Exhibitor's herd, Andrew Bros., Cedarville, Ohio.....	10 00
Second premium, S. A. Converse, Creseo, Iowa.....	5 00
Breeder's herd, Andrew Bros., Cedarville, Ohio.....	10 00
Second premium, S. A. Converse, Creseo, Iowa.....	5 00
Bull, any age, Andrew Bros., Cedarville, Ohio.....	10 00
Cow or heifer, any age, Andrew Bros., Cedarville, Ohio.....	10 00

CLASS XIV—Open to All Beef Breeds of Cattle.

Exhibitor's herd, F. A. Nave, Attica, Ind.....	\$250 00
Second premium, W. A. Boland, Grass Lake, Mich.....	150 00
Third premium, D. Bradfute & Son, Cedarville, Ohio.....	100 00
Bull, any age or breed, F. A. Nave, Attica, Ind.....	50 00
Cow or heifer, any age or breed, D. Bradfute & Son, Cedarville O..	50 00

DEPARTMENT D. CATTLE (DAIRY BREEDS.)

CLASS XV—Jerseys.

(F. S. Peer, Judge, Mt. Morris, N. Y.)

BULLS.

3 years old or over, John E. Robbins, Greensburg, Ind.....	\$15 00
Second premium, C. I. Hood, (Hood Farm) Lowell, Mass.....	10 00
Third premium, G. W. Tatsworth & Co., Orange, Ind.....	5 00
2 to 3 years old, C. I. Hood, (Hood Farm) Lowell, Mass.....	10 00
Second premium, John E. Robbins, Greensburg, Ind.....	7 00
Third premium, J. L. Thompson, Indianapolis, Ind.....	4 00
1 to 2 years old, H. N. Higinbotham, Joliet, Ill.....	8 00
Second premium, C. I. Hood, (Hood Farm) Lowell, Mass.....	6 00
Third premium, C. I. Hood, (Hood Farm) Lowell, Mass.....	3 00
Calf, John E. Robbins, Greensburg, Ind.....	5 00
Second premium, C. I. Hood, (Hood Farm) Lowell, Mass.....	3 00
Third premium, H. N. Higinbotham, Joliet, Ill.....	2 00

COWS AND HEIFERS.

3 years old or over, C. I. Hood, (Hood Farm) Lowell, Mass.....	15 00
Second premium, John E. Robbins, Greensburg, Ind.....	10 00
Third premium, John E. Robbins, Greensburg, Ind.....	5 00
2 to 3 years old, H. N. Higinbotham, Joliet, Ill.....	10 00
Second premium, John E. Robbins, Greensburg, Ind.....	7 00
Third premium, C. I. Hood, (Hood Farm) Lowell, Mass.....	4 00
1 to 2 years old, John E. Robbins, Greensburg, Ind.....	8 00
Second premium, C. I. Hood, (Hood Farm) Lowell, Mass.....	6 00
Third premium, C. I. Hood, (Hood Farm) Lowell, Mass.....	3 00
Calf, John E. Robbins, Greensburg, Ind.....	5 00
Second premium, H. N. Higinbotham, Joliet, Ill.....	3 00
Third premium, C. I. Hood, (Hood Farm) Lowell, Mass.....	2 00
Four animals, get of one sire, C. I. Hood, (Hood Farm) Lowell, Mass	10 00
Second premium, John E. Robbins, Greensburg, Ind.....	7 00
Third premium, H. N. Higinbotham, Joliet, Ill.....	4 00
Two animals, produce of one cow, John E. Robbins, Greensburg, Ind	10 00
Second premium, John E. Robbins, Greensburg, Ind.....	7 00
Third premium, Garretson Bros., Pendleton, Ind.....	4 00
Exhibitor's herd, John E. Robbins, Greensburg, Ind.....	20 00
Second premium, C. I. Hood, (Hood Farm) Lowell, Mass.....	10 00
Breeder's herd, John E. Robbins, Greensburg, Ind.....	20 00
Second premium, C. I. Hood, (Hood Farm) Lowell, Mass.....	10 00
Bull, any age, John E. Robbins, Greensburg, Ind.....	20 00
Cow or heifer, any age, C. I. Hood, (Hood Farm) Lowell, Mass....	20 00

CLASS XVI—Holstein-Fresian and Dutch Belted.

(F. S. Peer, Judge, Mt. Morris, N. Y.)

BULLS.

3 years old or over, Easthope & Biery, Allegheny, Penn.....	\$15 00
Second premium, W. B. Barney & Co., Hampton, Iowa.....	10 00
Third premium, W. B. Barney & Co., Hampton, Iowa.....	5 00
2 to 3 years old, Easthope & Biery, Allegheny, Penn.....	10 00
1 to 2 years old, W. B. Barney & Co., Hampton, Iowa.....	8 00
Second premium, W. B. Barney & Co., Hampton, Iowa.....	6 00
Third premium, Easthope & Biery, Allegheny, Penn.....	3 00
Calf, Easthope & Biery, Allegheny, Penn.....	5 00
Second premium, W. B. Barney & Co., Hampton, Iowa.....	3 00
Third premium, W. B. Barney & Co., Hampton, Iowa.....	2 00

COWS AND HEIFERS.

3 years old or over, W. B. Barney & Co., Hampton, Iowa.....	15 00
Second premium, Easthope & Biery, Allegheny, Penn.....	10 00
Third premium, W. B. Barney & Co., Hampton, Iowa.....	5 00
2 to 3 years old, Easthope & Biery, Allegheny, Penn.....	10 00
Second premium, W. B. Barney & Co., Hampton, Iowa.....	7 00
Third premium, Easthope & Biery, Allegheny, Penn.....	4 00
1 to 2 years old, W. B. Barney & Co., Hampton, Iowa.....	8 00
Second premium, Easthope & Biery, Allegheny, Penn.....	6 00
Third premium, W. B. Barney & Co., Hampton, Iowa.....	3 00
Calf, Easthope & Biery, Allegheny, Penn.....	5 00
Second premium, W. B. Barney & Co., Hampton, Iowa.....	3 00
Third premium, Easthope & Biery, Allegheny, Penn.....	2 00
Four animals, get of one sire, Easthope & Biery, Allegheny, Penn.	10 00
Second premium, W. B. Barney & Co., Hampton, Iowa.....	7 00
Two animals, produce of one cow, Easthope & Biery, Allegheny, Penn	10 00
Second premium, W. B. Barney & Co., Hampton, Iowa.....	7 00
Exhibitor's herd, Easthope & Biery, Allegheny, Penn.....	20 00
Second premium, W. B. Barney & Co., Hampton, Iowa.....	10 00
Breeder's herd, W. B. Barney & Co., Hampton, Iowa.....	20 00
Bull, any age, Easthope & Biery, Allegheny, Penn.....	20 00
Cow or heifer, any age, W. B. Barney & Co., Hampton, Iowa.....	20 00

CLASS XVII—Ayrshire.

(F. S. Peer, Judge, Mt. Morris, N. Y.)

BULLS.

3 years old or over, J. F. Converse & Co., Woodville, N. Y.....	\$15 00
Second premium, Howard Cook, Beloit, Ohio.....	10 00
Third premium, J. P. Beatly, Pataskala, Ohio.....	5 00
2 to 3 years old, J. F. Converse & Co., Woodville, N. Y.....	10 00
Second premium, J. P. Beatly, Pataskala, Ohio.....	7 00
1 to 2 years old, J. P. Beatly, Pataskala, Ohio.....	8 00
Second premium, J. F. Converse & Co., Woodville, N. Y.....	6 00
Third premium, Howard Cook, Beloit, Ohio.....	3 00
Calf, J. F. Converse & Co., Woodville, N. Y.....	5 00
Second premium, J. P. Beatly, Pataskala, Ohio.....	3 00
Third premium, Howard Cook, Beloit, Ohio.....	2 00

COWS AND HEIFERS.

3 years old or over, J. F. Converse & Co., Woodville, N. Y.....	15 00
Second premium, Howard Cook, Beloit, Ohio.....	10 00

Third premium, J. F. Converse & Co., Woodville, N. Y.....	5 00
2 to 3 years old, J. P. Beatly, Pataskala, Ohio.....	10 00
Second premium, Howard Cook, Beloit, Ohio.....	7 00
Third premium, J. P. Beatly, Pataskala, Ohio.....	4 00
1 to 2 years old, J. F. Converse & Co., Woodville, N. Y.....	8 00
Second premium, J. F. Converse & Co., Woodville, N. Y.....	6 00
Third premium, J. P. Beatly, Pataskala, Ohio.....	3 00
Calf, J. P. Beatly, Pataskala, Ohio.....	5 00
Second premium, J. F. Converse & Co., Woodville, N. Y.....	3 00
Third premium, Howard Cook, Beloit, Ohio.....	2 00
Four animals, get of one sire, Howard Cook, Beloit, Ohio.....	10 00
Second premium, J. F. Converse & Co., Woodville, N. Y.....	7 00
Third premium, J. P. Beatly, Pataskala, Ohio.....	4 00
Two animals, produce of one cow, J. F. Converse & Co., Woodville, N. Y	10 00
Second premium, Howard Cook, Beloit, Ohio.....	7 00
Third premium, J. P. Beatly, Pataskala, Ohio.....	4 00
Exhibitor's herd, J. F. Converse & Co., Woodville, N. Y.....	20 00
Second premium, J. F. Converse & Co., Woodville, N. Y.....	10 00
Breeder's herd, J. F. Converse & Co., Woodville, N. Y.....	20 00
Second premium, Howard Cook, Beloit, Ohio.....	10 00
Bull, any age, J. F. Converse & Co., Woodville, N. Y.....	20 00
Cow or heifer, any age, J. F. Converse & Co., Woodville, N. Y.....	20 00

CLASS XVIII—Guernseys.

(F. S. Peer, Judge, Mt. Morris, N. Y.)

BULLS.

3 years old or over, L. V. Axtell, Perry, Ohio.....	\$15 00
Second premium, McCormick & Edgerly, Pataskala, Ohio.....	10 00
2 to 3 years old, McCormick & Edgerly, Pataskala, Ohio.....	10 00
Second premium, L. V. Axtell, Perry, Ohio.....	7 00
1 to 2 years old, L. V. Axtell, Perry, Ohio.....	8 00
Second premium, L. V. Axtell, Perry, Ohio.....	6 00
Calf, John Morgan, Plainfield, Ind.....	5 00
Second premium, McCormick & Edgerly, Pataskala, Ohio.....	3 00
Third premium, McCormick & Edgerly, Pataskala, Ohio.....	2 00

COWS AND HEIFERS.

3 years old or over, L. V. Axtell, Perry, Ohio.....	15 00
Second premium, L. V. Axtell, Perry, Ohio.....	10 00
Third premium, L. V. Axtell, Perry, Ohio.....	5 00

2 to 3 years old, L. V. Axtell, Perry, Ohio.....	10 00
Second premium, L. V. Axtell, Perry, Ohio.....	7 00
Third premium, McCormick & Edgerly, Pataskala, Ohio.....	4 00
1 to 2 years old, McCormick & Edgerly, Pataskala, Ohio.....	8 00
Second premium, L. V. Axtell, Perry, Ohio.....	6 00
Third premium, John Morgan, Plainfield, Ind.....	3 00
Calf, L. V. Axtell, Perry, Ohio.....	5 00
Second premium, L. V. Axtell, Perry, Ohio.....	3 00
Third premium, L. V. Axtell, Perry, Ohio.....	2 00
Four animals, get of one sire, L. V. Axtell, Perry, Ohio.....	10 00
Second premium, McCormick & Edgerly, Pataskala, Ohio.....	7 00
Two animals, produce of one cow, McCormick & Edgerly, Pataskala, Ohio	10 00
Second premium, John Morgan, Plainfield, Ind.....	7 00
Third premium, L. V. Axtell, Perry, Ohio.....	4 00
Exhibitor's herd, L. V. Axtell, Perry, Ohio.....	20 00
Second premium, L. V. Axtell, Perry, Ohio.....	10 00
Breeder's herd, L. V. Axtell, Perry, Ohio.....	20 00
Second premium, McCormick & Edgerly, Pataskala, Ohio.....	10 00
Bull, any age, McCormick & Edgerly, Pataskala, Ohio.....	20 00
Cow, any age, L. V. Axtell, Perry, Ohio.....	20 00

DEPARTMENT E. SHEEP.

CLASS XIX—Shropshire Sheep.

(Marion Williams, Judge, Muncie, Ind.)

RAMS.

2 years old or over, George Allen, Allerton, Ill.....	\$10 00
Second premium, Howard G. Davison, Millbrook, N. Y.....	6 00
Third premium, George Allen, Allerton, Ill.....	4 00
1 to 2 years old, George Allen, Allerton, Ill.....	10 00
Second premium, George Allen, Allerton, Ill.....	6 00
Third premium, Howard G. Davison, Millbrook, N. Y.....	4 00
Lamb, George Allen, Allerton, Ill.....	10 00
Second premium, George Allen, Allerton, Ill.....	6 00
Third premium, George Allen, Allerton, Ill.....	4 00

EWES.

3 years old or over, George Allen, Allerton, Ill.....	10 00
Second premium, George Allen, Allerton, Ill.....	6 00
Third premium, Howard G. Davison, Millbrook, N. Y.....	4 00
1 to 2 years old, George Allen, Allerton, Ill.....	10 00
Second premium, Howard G. Davison, Millbrook, N. Y.....	6 00
Third premium, Howard G. Davison, Millbrook, N. Y.....	4 00
Lamb, George Allen, Allerton, Ill.....	10 00
Second premium, George Allen, Allerton, Ill.....	6 00
Third premium, Howard G. Davison, Millbrook, N. Y.....	4 00

FLOCKS.

Aged flock, George Allen, Allerton, Ill.....	10 00
Second premium, Howard G. Davison, Millbrook, N. Y.....	6 00
Third premium, George Allen, Allerton, Ill.....	2 00
Young flock, George Allen, Allerton, Ill.....	10 00
Second premium, William Axe & Sons, Westchester, Ind.....	6 00
Third premium, William Furry & Son, New Palestine, Ind.....	2 00
Ram, any age, George Allen, Allerton, Ill.....	10 00
Ewe, any age, George Allen, Allerton, Ill.....	10 00

CLASS XX—Oxford Down.

(Marion Williams, Judge, Muncie, Ind.)

RAMS.

2 years old or over, R. J. Stone, Stonington, Ill.....	\$10 00
Second premium, Sid Conger, Hope, Ind.....	6 00
Third premium, Robert M. Cauffman, Buchanan, Mich.....	4 00
1 to 2 years old, Sid Conger, Hope, Ind.....	10 00
Second premium, R. J. Stone, Stonington, Ill.....	6 00
Third premium, Robert M. Cauffman, Buchanan, Mich.....	4 00
Lamb, R. J. Stone, Stonington, Ill.....	10 00
Second premium, R. J. Stone, Stonington, Ill.....	6 00
Third premium, Wilson Bros., Muncie, Ind.....	4 00

EWES.

2 years old or over, R. J. Stone, Stonington, Ill.....	10 00
Second premium, R. J. Stone, Stonington, Ill.....	6 00
Third premium, R. J. Stone, Stonington, Ill.....	4 00
1 to 2 years old, R. J. Stone, Stonington, Ill.....	10 00
Second premium, R. J. Stone, Stonington, Ill.....	6 00

Third premium, Sid Conger, Hope, Ind.....	4 00
Lamb, R. J. Stone, Stonington, Ill.....	10 00
Second premium, R. J. Stone, Stonington, Ill.....	6 00
Third premium, Wilson Bros., Muncie, Ind.....	4 00
Aged flock, R. J. Stone, Stonington, Ill.....	10 00
Second premium, R. J. Stone, Stonington, Ill.....	6 00
Third premium, Sid Conger, Hope, Ind.....	2 00
Young flock, Wilson Bros., Muncie, Ind.....	10 00
Second premium, R. J. Stone, Stonington, Ill.....	6 00
Third premium, Sid Conger, Hope, Ind.....	2 00
Ram, any age, Sid Conger, Hope, Ind.....	10 00
Ewe, any age, R. J. Stone, Stonington, Ill.....	10 00

AMERICAN OXFORD DOWN RECORD ASSOCIATION'S SPECIAL PREMIUMS.

Yearling ram, Sid Conger, Hope, Ind.....	\$15 00
Second premium, Sid Conger, Hope, Ind.....	10 00
Yearling ewe, Sid Conger, Hope, Ind.....	15 00
Second premium, Sid Conger, Hope, Ind.....	10 00
Four lambs, Wilson Bros., Muncie, Ind.....	15 00
Second premium, Sid Conger, Hope, Ind.....	10 00

CLASS XXI—Southdown.

(Uriah Privitt, Judge, Greensburg, Ind.)

RAMS.

2 years old or over, George Allen, Allerton, Ill.....	\$10 00
Second premium, George Allen, Allerton, Ill.....	6 00
Third premium, Sid Conger, Hope, Ind.....	4 00
1 to 2 years old, George Allen, Allerton Ill.....	10 00
Second premium, George Allen, Allerton, Ill.....	6 00
Third premium, W. B. Harvey & Co., Bloomington, Ind.....	4 00
Lamb, George Allen, Allerton, Ill.....	10 00
Second premium, George Allen, Allerton, Ill.....	6 00
Third premium, George Allen, Allerton, Ill.....	4 00

EWES.

2 years old or over, George Allen, Allerton, Ill.....	10 00
Second premium, Watt Wilson & Son, Muncie, Ind.....	6 00
Third premium, George Allen, Allerton, Ill.....	4 00
1 to 2 years old, George Allen, Allerton, Ill.....	10 00
Second premium, George Allen, Allerton, Ill.....	6 00
Third premium, Sid Conger, Hope, Ind.....	4 00
Lamb, George Allen, Allerton, Ill.....	10 00

Second premium, Watt Wilson & Son, Muncie, Ind.....	6 00
Third premium, George Allen, Allerton, Ill.....	4 00
Aged flock, Sid Conger, Hope, Ind.....	10 00
Second premium, Watt Wilson & Son, Muncie, Ind.....	6 00
Young flock, George Allen, Allerton, Ill.....	10 00
Second premium, Watt Wilson & Son, Muncie, Ind.....	6 00
Third premium, Sid Conger, Hope, Ind.....	2 00
Ram, any age, George Allen, Allerton, Ill.....	10 00
Ewe, any age, George Allen, Allerton, Ill.....	10 00

CLASS XXII—Hampshire Down.

(Marion Williams, Judge, Muncie, Ind.)

RAMS.

2 years old or over, John Milton, Marshall, Mich.....	\$5 00
1 to 2 years old, John Milton, Marshall, Mich.....	5 00
Lamb, John Milton, Marshall, Mich.....	5 00
Second premium, John Milton, Marshall, Mich.....	3 00
Third premium, John Milton, Marshall, Mich.....	2 00

EWES.

2 years old or over, John Milton, Marshall, Mich.....	5 00
Second premium, John Milton, Marshall, Mich.....	3 00
1 to 2 years old, John Milton, Marshall, Mich.....	5 00
Second premium, George Harding & Son, Waukesha, Wis.....	3 00
Third premium, John Milton, Marshall, Mich.....	2 00
Lamb, John Milton, Marshall, Mich.....	5 00
Second premium, John Milton, Marshall, Mich.....	3 00
Third premium, John Milton, Marshall, Mich.....	2 00
Aged flock, John Milton, Marshall, Mich.....	5 00
Young flock, John Milton, Marshall, Mich.....	5 00
Second premium, John Milton, Marshall, Mich.....	3 00
Ram, any age, John Milton, Marshall, Mich.....	5 00
Ewe, any age, John Milton, Marshall, Mich.....	5 00

CLASS XXIII—Cotswold.

(Uriah Privitt, Judge, Greensburg, Ind.)

RAMS.

2 years old or over, George Harding & Son, Waukesha, Wis.....	\$10 00
Second premium, Wilson Bros., Muncie, Ind.....	6 00
Third premium, George Harding & Son, Waukesha, Wis.....	4 00

1 to 2 years old, George Harding & Son, Waukesha, Wis.....	10 00
Second premium, George Harding & Son, Waukesha, Wis.....	6 00
Third premium, Wilson Bros., Muncie, Ind.....	4 00
Lamb, Wilson Bros., Muncie, Ind.....	10 00
Second premium, George Harding & Son, Waukesha, Wis.....	6 00
Third premium, George Harding & Son, Waukesha, Wis.....	4 00

EWES.

2 years old or over, Wilson Bros., Muncie, Ind.....	10 00
Second premium, George Harding & Son, Waukesha, Wis.....	6 00
Third premium, George Harding & Son, Waukesha, Wis.....	4 00
1 to 2 years old, George Harding & Son, Waukesha, Wis.....	10 00
Second premium, George Harding & Son, Waukesha, Wis.....	6 00
Third premium, Wilson Bros., Muncie, Ind.....	4 00
Lamb, Wilson Bros., Muncie, Ind.....	10 00
Second premium, George Harding & Son, Waukesha, Wis.....	6 00
Third premium, George Harding & Son, Waukesha, Wis.....	4 00
Aged flock, Wilson Bros., Muncie, Ind.....	10 00
Young flock, Wilson Bros., Muncie, Ind.....	10 00
Second premium, Wilson Bros., Muncie, Ind.....	6 00
Ram, any age, George Harding & Son, Waukesha, Wis.....	10 00
Ewe, any age, George Harding & Son, Waukesha, Wis.....	10 00

CLASS XXV—Dorsets.

(Marion Williams, Judge, Muncie, Ind.)

RAMS.

2 years old or over, Rutherford Stuyvesant, Allamuchy, N. J.....	\$5 00
Second premium, Rutherford Stuyvesant, Allamuchy, N. J.....	3 00
Third premium, I. E. Wing, Champaign, O.....	2 00
1 to 2 years old, Rutherford Stuyvesant, Allamuchy, N. J.....	5 00
Second premium, Rutherford Stuyvesant, Allamuchy, N. J.....	3 00
Third premium, Gifford & Nash, Tipton, Ind.....	2 00
Lamb, Rutherford Stuyvesant, Allamuchy, N. J.....	5 00
Second premium, Rutherford Stuyvesant, Allamuchy, N. J.....	3 00
Third premium, Gifford & Nash, Tipton, Ind.....	2 00

EWES.

2 years old or over, Rutherford Stuyvesant, Allamuchy, N. J.....	5 00
Second premium, Rutherford Stuyvesant, Allamuchy, N. J.....	3 00
Third premium, Gifford & Nash, Tipton, Ind.....	2 00
1 to 2 years old, Rutherford Stuyvesant, Allamuchy, N. J.....	5 00

Second premium, Rutherford Stuyvesant, Allamuchy, N. J.....	3 00
Third premium, Gifford & Nash, Tipton, Ind.....	2 00
Lamb, Rutherford Stuyvesant, Allamuchy, N. J.....	5 00
Second premium, Rutherford Stuyvesant, Allamuchy N. J.....	3 00
Third premium, I. E. Wing, Champaign, O.....	2 00
Aged flock, Rutherford Stuyvesant, Allamuchy, N. J.....	5 00
Young flock, Rutherford Stuyvesant, Allamuchy, N. J.....	5 00
Second premium, Gifford & Nash, Tipton, Ind.....	3 00
Ram, any age, Rutherford Stuyvesant, Allamuchy, N. J.....	5 00
Ewe, any age, Rutherford Stuyvesant, Allamuchy, N. J.....	5 00

CONTINENTAL DORSET CLUB'S SPECIAL PREMIUM.

Pen, four lambs, Rutherford Stuyvesant, Allamuchy, N. J.....	15 00
Second premium, Rutherford Stuyvesant, Allamuchy, N. J.....	10 00

CLASS XXVI--Rambouillet.

(Uriah Privitt, Judge, Greensburg, Ind.)

RAMS.

3 years old or over, A. A. Bates, Irwin, O.....	\$5 00
Second premium, George Harding & Son, Waukesha, Wis.....	3 00
Third premium, Forgey & Evans, Crawfordsville, Ind.....	2 00
1 to 2 years old, A. A. Bates, Irwin, O.....	5 00
Second premium, George Harding & Son, Waukesha, Wis.....	3 00
Third premium, George Harding & Son, Waukesha, Wis.....	2 00
Lamb, A. A. Bates, Irwin, O.....	5 00
Second premium, George Harding & Son, Waukesha, Wis.....	3 00
Third premium, Forgey & Evans, Crawfordsville, Ind.....	2 00

EWES.

2 years old or over, George Harding & Son, Waukesha, Wis.....	5 00
Second premium, Forgey & Evans, Crawfordsville, Ind.....	3 00
Third premium, A. A. Bates, Irwin, O.....	2 00
1 to 2 years old, John E. Webb, Southport, Ind.....	5 00
Second premium, A. A. Bates, Irwin, O.....	3 00
Third premium, A. A. Bates, Irwin, O.....	2 00
Lamb, Forgey & Evans, Crawfordsville, Ind.....	5 00
Second premium, A. A. Bates, Irwin, O.....	3 00
Third premium, A. A. Bates, Irwin, O.....	2 00
Aged flock, A. A. Bates, Irwin, O.....	5 00
Second premium, A. A. Bates, Irwin, O.....	3 00
Young flock, A. A. Bates, Irwin, O.....	5 00
Ram, any age, A. A. Bates, Irwin, O.....	5 00
Ewe, any age, George Harding & Son, Waukesha, Wis.....	5 00

CLASS XXVII—Fine Wool, American Merino.

(Marion Williams, Judge, Muncie, Ind.)

(Uriah Privitt, Judge, Greensburg, Ind.)

RAMS.

2 years old or over, F. W. Perkins, W. Mansfield, O.....	\$5 00
Second premium, W. A. Carver, Crawfordsville, Ind.....	3 00
Third premium, Uriah Cook, W. Mansfield, O.....	2 00
1 to 2 years old, Uriah Cook, W. Mansfield, O.....	5 00
Second premium, J. P. Baxla, Anthony, Ind.....	3 00
Third premium, Uriah Cook, W. Mansfield, O.....	2 00
Lamb, F. W. Perkins, W. Mansfield, O.....	5 00
Second premium, W. A. Carver, Crawfordsville, Ind.....	3 00
Third premium, W. A. Carver, Crawfordsville, Ind.....	2 00

EWES.

2 years old or over, Uriah Cook, W. Mansfield, O.....	5 00
Second premium, F. W. Perkins, W. Mansfield, O.....	3 00
Third premium, W. A. Carver, Crawfordsville, Ind.....	2 00
1 to 2 years old, W. A. Carver, Crawfordsville, Ind.....	5 00
Second premium, Uriah Cook, W. Mansfield, O.....	3 00
Third premium, Uriah Cook, W. Mansfield, O.....	2 00
Lamb, J. P. Baxla, Anthony, Ind.....	5 00
Second premium, Uriah Cook, W. Mansfield, O.....	3 00
Third premium, W. A. Carver, Crawfordsville, Ind.....	2 00
Aged flock, Uriah Cook, W. Mansfield, O.....	5 00
Second premium, W. A. Carver, Crawfordsville, Ind.....	3 00
Third premium, F. W. Perkins, W. Mansfield, O.....	2 00
Young flock, Uriah Cook, W. Mansfield, O.....	5 00
Second premium, J. P. Baxla, Anthony, Ind.....	3 00
Ram, any age, F. W. Perkins, W. Mansfield, O.....	5 00
Ewe, any age, Uriah Cook, W. Mansfield, O.....	5 00

CLASS XXVIII—Delaine Merinos.

(Uriah Privitt, Judge, Greensburg, Ind.)

RAMS.

2 years old or over C. H. Williams, Church, Mich.....	\$5 00
Second premium, C. H. Williams, Church, Mich.....	3 00
1 to 2 years old, A. T. Gamber, Weston, Mich.....	5 00
Second premium, A. T. Gamber, Weston, Mich.....	3 00

U O F A

Third premium, C. H. Williams, Church, Mich.....	3 00
Lamb, A. T. Gamber, Weston, Mich.....	5 00
Second premium, A. T. Gamber, Weston, Mich.....	3 00

EWES.

2 years old or over, A. T. Gamber, Weston, Mich.....	5 00
Second premium, C. H. Williams, Church, Mich.....	3 00
Third premium, A. T. Gamber, Weston, Mich.....	2 00
1 to 2 years old, A. T. Gamber, Weston, Mich.....	5 00
Second premium, A. T. Gamber, Weston, Mich.....	3 00
Third premium, 2 years old or over, C. H. Williams, Church, Mich.	2 00
Lamb, A. T. Gamber, Weston, Mich.....	5 00
Second premium, A. T. Gamber, Weston, Mich.....	3 00
Third premium, A. T. Gamber, Weston, Mich.....	2 00
Aged flock, A. T. Gamber, Weston, Mich.....	5 00
Second premium, A. T. Gamber, Weston, Mich.....	3 00
Third premium, C. H. Williams, Church, Mich.....	2 00
Young flock, A. T. Gamber, Weston, Mich.....	5 00
Second premium, A. T. Gamber, Weston, Mich.....	3 00
Third premium, C. H. Williams, Church, Mich.....	2 00
Ram, any age, A. T. Gamber, Weston, Mich.....	5 00
Ewe, any age, A. T. Gamber, Weston, Mich.....	5 00

CLASS XXIX—Cheviot.

(Marion Williams, Judge, Muncie, Ind.)

RAMS.

2 years old and over, W. S. Crodian, Fincastle, Ind.....	\$5 00
Second premium, W. S. Crodian, Fincastle, Ind.....	3 00
Third premium, Luther Gardner, Fincastle, Ind.....	2 00
1 to 2 years old, W. S. Crodian, Fincastle, Ind.....	5 00
Second premium, W. S. Crodian, Fincastle, Ind.....	3 00
Third premium, Luther Gardner, Fincastle, Ind.....	2 00
Lamb, W. S. Crodian Fincastle, Ind.....	5 00
Second premium, Luther Gardner, Fincastle, Ind.....	3 00
Third premium, W. S. Crodian, Fincastle, Ind.....	2 00

EWES.

2 years old or over, W. S. Crodian, Fincastle, Ind.....	5 00
Second premium, W. S. Crodian, Fincastle, Ind.....	3 00
1 to 2 years old, W. S. Crodian, Fincastle, Ind.....	5 00
Second premium, Luther Gardner, Fincastle, Ind.....	3 00

Third premium, W. S. Crodian, Fincastle, Ind.....	2 00
Lamb, W. S. Crodian, Fincastle, Ind.....	5 00
Second premium, W. S. Crodian, Fincastle, Ind.....	3 00
Third premium, Luther Gardner, Fincastle, Ind.....	2 00
Aged flock, W. S. Crodian, Fincastle, Ind.....	5 00
Second premium, W. S. Crodian, Fincastle, Ind.....	3 00
Young flock, W. S. Crodian, Fincastle, Ind.....	5 00
Second premium, Luther Gardner, Fincastle, Ind.....	3 00
Ram, any age, W. S. Crodian, Fincastle, Ind.....	5 00
Ewe, any age, W. S. Crodian, Fincastle, Ind.....	5 00

DEPARTMENT F. SWINE.

CLASS XXX—Berkshires.

(J. F. Elliott, Vincennes, Ind.)

BOARS.

2 years old or over, John F. Stover, Crawfordsville, Ind.....	\$12 00
Second premium, James Riley, Sons & Co., Thorntown, Ind.....	8 00
Third premium, A. S. Gilmour, Greensburg, Ind.....	4 00
1 to 2 years old, I. N. Parker & Son, Thorntown, Ind.....	10 00
Second premium, C. I. Hood, Lowell, Mass.....	7 00
Third premium, Everett Evans, Edwards, Ind.....	3 00
6 to 12 months old, George W. Jessup, Bellmoore, Ind.....	8 00
Second premium, James Riley, Sons & Co., Thorntown, Ind.....	5 00
Third premium, James Riley, Sons & Co., Thorntown, Ind.....	2 00
Under 6 months old, James Riley, Sons & Co., Thorntown, Ind....	8 00
Second premium, I. N. Parker & Son, Thorntown, Ind.....	5 00
Third premium, James Riley, Sons & Co., Thorntown, Ind.....	2 00

SOWS.

2 years old or over, U. Z. Green, Indianola, Ill.....	12 00
Second premium, C. I. Hood, Lowell, Mass.....	8 00
Third premium, James Riley, Sons & Co., Thorntown, Ind.....	4 00
1 to 2 years old, John F. Stover, Crawfordsville, Ind.....	10 00
Second premium, John F. Stover, Crawfordsville, Ind.....	7 00
Third premium, John F. Stover, Crawfordsville, Ind.....	3 00

6 to 12 months old, George W. Jessup, Bellmore, Ind.....	8 00
Second premium, U. Z. Green, Indianola, Ill.....	5 00
Third premium, James Riley, Sons & Co., Thorntown, Ind.....	2 00
Pig, I. N. Parker & Son, Thorntown, Ind.....	8 00
Second premium, James Riley, Sons & Co., Thorntown, Ind.....	5 00
Third premium, James Riley, Sons & Co., Thorntown, Ind.....	2 00

HERDS.

Aged herd, John F. Stover, Crawfordsville, Ind.....	20 00
Second premium, James Riley, Sons & Co., Thorntown, Ind.....	10 00
Young herd, James Riley, Sons & Co., Thorntown, Ind.....	15 00
Second premium, George W. Jessup, Bellmore, Ind.....	10 00
5 pigs by same boar and same sow, James Riley, Sons & Co., Thorntown, Ind.....	12 00
Second premium, James Riley, Sons & Co., Thorntown, Ind.....	8 00
5 pigs, under 6 months old, James Riley, Sons & Co., Thorntown, Ind.	12 00
Second premium, I. N. Parker & Son, Thorntown, Ind.....	8 00
Pair of pigs, under 1 year old, George W. Jessup, Bellmore, Ind...	12 00
Second premium, I. N. Parker & Son, Thorntown, Ind.....	8 00
Boar, any age, I. N. Parker & Son, Thorntown, Ind.....	20 00
Sow, any age, John F. Stover, Crawfordsville, Ind.....	20 00

CLASS XXXI--Poland China.

(Lloyd Mugg, W. O. Reveal, E. W. Haines, Judges.)

BOARS.

2 years old or over, A. S. Gilmour, Greensburg, Ind.....	\$12 00
Second premium, Lucien Arbuckle, Hope, Ind.....	8 00
Third premium, T. E. Lindley, Russiaville, Ind.....	4 00
1 to 2 years old, D. R. Perry, Columbus, Ind.....	10 00
Second premium, W. E. Hendricks, Martinsville, Ind.....	7 00
Third premium, James W. Ramsey, Mt. Carmel, Ill.....	3 00
6 to 12 months old, J. W. Williams & Sons, Briant, Ind.....	8 00
Second premium, Shellenberger & Cox, Camden, O.....	5 00
Third premium, D. R. Perry, Columbus, Ind.....	2 00
Pig, W. O. Reveal, Indianapolis, Ind.....	8 00
Second premium, F. Gartin & Sons, Burney, Ind.....	5 00
Third premium, W. A. Smiley, Milligan, Ind.....	2 00

SOWS.

2 years old or over, T. E. Lindley, Russiaville, Ind.....	12 00
Second premium, W. A. Smiley, Milligan, Ind.....	8 00

Third premium, Lucien Arbuckle, Hope, Ind.....	4 00
1 to 2 years old, R. L. Bratton, New Ross, Ind.....	10 00
Second premium, Bust & Wood, Mt. Carmel, Ill.....	7 00
Third premium, Adam F. May, Flat Rock, Ind.....	3 00
6 to 12 months old, Adam F. May, Flat Rock, Ind.....	8 00
Second premium, Shellenberger & Cox, Camden, O.....	5 00
Third premium, Joe Cunningham & Co., Loree, Ind.....	2 00
Pig, W. C. Williams & Co., Knightstown, Ind.....	8 00
Second premium, W. O. Reveal, Indianapolis, Ind.....	5 00
Third premium, Shellenberger & Cox, Camden, O.....	2 00

HERDS.

Aged herd, Robert Longfellow, Ging, Ind.....	20 00
Second premium, W. E. Hendricks, Martinsville, Ind.....	10 00
Young herd, Shellenberger & Cox., Camden, O.....	15 00
Second premium, J. W. Williams & Sons, Briant, Ind.....	10 00
Five pigs by one boar and one sow, Shellenberger & Cox, Cam- den, O.....	12 00
Second premium, W. O. Reveal, Indianapolis, Ind.....	8 00
5 pigs under 6 months, W. O. Reveal, Indianapolis, Ind.....	12 00
Second premium, Shellenberger & Cox., Camden, O.....	8 00
Pair of pigs, under 1 year old, Shellenberger & Cox, Camden, O....	12 00
Second premium, W. O. Reveal, Indianapolis, Ind.....	8 00
Boar, any age, D. R. Perry, Columbus, Ind.....	20 00
Sow, any age, Adam F. May, Flat Rock, Ind.....	20 00

CLASS XXXII—Chester White, Victoria, Chesshire and Large Yorkshire.

(John Harcourt, Judge.)

BOARS.

2 years old or over, John M. Doty & Sons, Charleston, Ill.....	\$12 00
Second premium, Warren W. Trout, Greenwood, Ind.....	8 00
Third premium, Dorsey Bros., Perry, Ill.....	4 00
1 to 2 years old, Warren W. Trout, Greenwood, Ind.....	10 00
Second premium, Dorsey Bros., Perry, Ill.....	7 00
Third premium, R. S. Russell, Zionsville, Ind.....	3 00
6 months to 1 year, John M. Doty & Sons, Charleston, Ill.....	8 00
Second premium, S. H. Martin, Alexandria, O.....	5 00
Third premium, R. S. Russell, Zionsville, Ind.....	2 00
Pig, S. H. Martin, Alexandria, O.....	8 00
Second premium, R. S. Russell, Zionsville, Ind.....	5 00
Third premium, Dorsey Bros., Perry, Ill.....	2 00

SOWS.

2 years old or over, Warren W. Trout, Greenwood, Ind.....	12 00
Second premium, Dorsey Bros., Perry, Ill.....	8 00
Third premium, Warren W. Trout, Greenwood, Ind.....	4 00
1 to 2 years old, John M. Doty & Sons, Charleston, Ill.....	10 00
Second premium, Warren W. Trout, Greenwood, Ind.....	7 00
Third premium, John M. Doty & Sons, Charleston, Ill.....	3 00
6 to 12 months old, S. H. Martin, Alexandria, O.....	8 00
Second premium, Dorsey Bros., Perry, Ill.....	5 00
Third premium, John M. Doty & Sons, Charleston, Ill.....	2 00
Pig, R. S. Russell, Zionsville, Ind.....	8 00
Second premium, S. H. Martin, Alexandria, O.....	5 00
Third premium, Dorsey Bros., Perry, Ill.....	2 00

HERDS.

Aged herd, John M. Doty & Sons, Charleston, Ill.....	20 00
Second premium, Warren W. Trout, Greenwood Ind.....	10 00
Young herd, S. H. Martin, Alexandria, O.....	15 00
Second premium, John M. Doty & Sons, Charleston, Ill.....	10 00
Five pigs by one boar and one sow, S. H. Martin, Alexandria, O...	12 00
Second premium, R. S. Russell, Zionsville, Ind.....	8 00
Five pigs under six months old, John M. Doty & Sons, Charleston, Ill	12 00
Second premium, R. S. Russell, Zionsville, Ind.....	8 00
Pair of pigs under one year old, John M. Doty & Sons, Charleston, Ill	12 00
Second premium, S. H. Martin, Alexandria, Ohio.....	8 00
Boar, any age, John M. Doty & Sons, Charleston, Ill.....	20 00
Sow, any age, Warrren W. Trout, Greenwood, Ind.....	20 00

CLASS XXXIII—Duroc-Jersey, Tainworth, and Thin Rind.

(Lloyd Mugg. Judge, Center, Ind.)

BOARS.

2 years or over, G. W. Titsworth & Co., Orange, Ind.....	\$12 00
Second premium, G. W. Titsworth & Co., Orange, Ind.....	8 00
Third premium, Edwin Kirkpatrick, New Richmond, Ind.....	4 00
1 to 2 years old, Moorman Brown & Co., Castle, Ind.....	10 00
Second premium, O. Walter & Son, Lebanon, Ohio.....	7 00
Third premium, G. W. Titsworth & Co., Orange, Ind.....	3 00
6 to 12 months old, O. Walter & Son, Lebanon, Ohio.....	8 00

Second premium, O. Walter & Son, Lebanon, Ohio.....	5 00
Third premium, Clayton Bonadaile, Camden, Ohio.....	2 00
Pigs, Moorman Brown & Co., Castle, Ind.....	8 00
Second premium, O. Walter & Son, Lebanon, Ohio.....	5 00
Third premium, Moorman Brown & Co., Castle, Ind.....	2 00

SOWS.

2 years old or over, O. Walter & Son, Lebanon, Ohio.....	12 00
Second premium, Moorman Brown & Co., Castle, Ind.....	8 00
Third premium, O. Walter & Son, Lebanon, Ohio.....	4 00
1 to 2 years old, O. Walter & Son, Lebanon, Ohio.....	10 00
Second premium, Moorman Brown & Co., Castle, Ind.....	7 00
Third premium, Clayton Bonadaile, Camden, Ohio.....	3 00
6 to 12 months old, O. Walter & Son, Lebanon, Ohio.....	8 00
Second premium, Moorman Brown & Co., Castle, Ind.....	5 00
Third premium, Moorman Brown & Co., Castle, Ind.....	2 00
Pigs, O. Walter & Son, Lebanon, Ohio.....	8 00
Second premium, Moorman Brown & Co., Castle, Ind.....	5 00
Third premium, Moorman Brown & Co., Castle, Ind.....	2 00

HERDS.

Aged herd, O. Walter & Son, Lebanon, Ohio.....	20 00
Second premium, Moorman Brown & Co., Castle, Ind.....	10 00
Young herd, O. Walter & Son, Lebanon, Ohio.....	15 00
Second premium, Moorman Brown & Co., Castle, Ind.....	10 00
Five pigs by one boar and one sow, O. Walter & Son, Lebanon, Ohio	12 00
Second premium, Moorman Brown & Co., Castle, Ind.....	8 00
Five pigs under 6 months, Moorman Brown & Co., Castle, Ind.....	12 00
Second premium, O. Walter & Son, Lebanon, Ohio.....	8 00
Pair of pigs under 1 year old, O. Walter & Son, Lebanon, Ohio.....	12 00
Second premium, Moorman Brown & Co., Castle, Ind.....	8 00
Boar, any age, Moorman Brown & Co., Castle, Ind.....	20 00
Sow, any age, O. Walter & Son, Lebanon, Ohio.....	20 00

CLASS XXXIV--Essex, Suffolk, and Small Yorkshire.

(J. F. Elliott, Judge, Vincennes, Ind.)

BOARS.

2 years old or over, A. C. Green & Son, Winchester, Ind.....	\$6 00
Second premium, Bascom & McMurray, California, Mich.....	4 00

Third premium, Stoltz Bros., Winchester, Ind.....	2 00
1 to 2 years old, Bascom & McMurray, California, Mich.....	5 00
Second premium, Stoltz Bros., Winchester, Ind.....	3 00
Third premium, A. C. Green & Son, Winchester, Ind.....	2 00
6 to 12 months old, Bascom & McMurray, California, Mich.....	4 00
Second premium, Bascom & McMurray, California, Mich.....	3 00
Third premium, Stoltz Bros., Winchester, Ind.....	2 00
Pig, Bascom & McMurray, California, Mich.....	4 00
Second premium, A. C. Green & Son, Winchester, Ind.....	3 00
Third premium, Stoltz Bros., Winchester, Ind.....	2 00

SOWS.

2 years old or over, Bascom & McMurray, California, Mich.....	6 00
Second premium, A. C. Green & Son, Winchester, Ind.....	4 00
Third premium, Stoltz Bros., Winchester, Ind.....	2 00
1 to 2 years old, Bascom & McMurray, California, Mich.....	5 00
Second premium, Bascom & McMurray, California, Mich.....	3 00
Third premium, Bascom & McMurray, California, Mich.....	2 00
6 to 12 months old, Bascom & McMurray, California, Mich.....	4 00
Second premium, Bascom & McMurray, California, Mich.....	3 00
Third premium, Bascom & McMurray, California, Mich.....	2 00
Pig, Bascom & McMurray, California, Mich.....	4 00
Second premium, Bascom & McMurray, California, Mich.....	3 00
Third premium, A. C. Green & Son, Winchester, Ind.....	2 00

HERDS.

Aged herd Bascom & McMurray, California, Mich.....	10 00
Second premium, A. C. Green & Son, Winchester, Ind.....	5 00
Young herd, Bascom & McMurray, California, Mich.....	8 00
Second premium, A. C. Green & Son, Winchester, Ind.....	5 00
Five pigs by one boar and one sow, Bascom & McMurray, California, Mich	6 00
Second premium, Bascom & McMurray, California, Mich.....	4 00
Five pigs under 6 months old, Bascom & McMurray, California, Mich	6 00
Second premium, A. C. Green & Son, Winchester, Ind.....	4 00
Pair of pigs under 1 year old, Bascom & McMurray, California, Mich	6 00
Second premium, Bascom & McMurray, California, Mich.....	4 00
Boar, any age, Bascom & McMurray, California, Mich.....	10 00
Sow, any age, Bascom & McMurray, California, Mich.....	10 00

DEPARTMENT G. POULTRY.

CLASS XXXV—Asiatics.

(Q. N. Barker and B. N. Pierce, Judges.)

Light Brahma cock, Charles A. Snyder, Waynetown, Ind.....	\$3 00
Second premium, James A. Tucker, Concord, Mich.....	2 00
Light Brahma hen, Charles A. Snyder, Waynetown, Ind.....	3 00
Second premium, William Grose, Middletown, Ind.....	2 00
Light Brahma cockerel, N. E. Wood, Pecksburg, Ind.....	3 00
Second premium, Charles A. Snyder, Waynetown, Ind.....	2 00
Light Brahma pullet, N. E. Wood, Pecksburg, Ind.....	3 00
Second premium, Sid Conger, Hope, Ind.....	2 00
Light Brahma, breeding pen, Charles A. Snyder, Waynetown, Ind..	8 00
Second premium, N. E. Wood, Pecksburg, Ind.....	4 00
Dark Brahma cock, Ed L. May, Indianapolis, Ind.....	1 50
Second premium, Thomas H. Buck, Morristown, Ind.....	50
Dark Brahma hen, J. P. Baxla, Anthony, Ind.....	1 50
Second premium, Rainey Miller, Indianapolis, Ind.....	50
Dark Brahma cockerel, James A. Tucker, Concord, Mich.....	1 50
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	50
Dark Brahma pullet, James A. Tucker, Concord, Mich.....	1 50
Second premium, James A. Tucker, Concord, Mich.....	50
Dark Brahma, breeding pen, Ed L. May, Indianapolis, Ind.....	4 00
Second premium, B. F. Duncan, Greenfield, Ind.....	2 00
Buff Cochin cock, O. L. McCord, Danville, Ill.....	3 00
Second premium, James A. Tucker, Concord, Mich.....	2 00
Buff Cochin hen, O. L. McCord, Danville, Ill.....	3 00
Second premium, O. L. McCord, Danville, Ill.....	2 00
Buff Cochin cockerel, Rainey Miller, Indianapolis, Ind.....	3 00
Second premium, O. L. McCord, Danville, Ill.....	2 00
Buff Cochin pullet, O. L. McCord, Danville, Ill.....	3 00
Second premium, Rainey Miller, Indianapolis, Ind.....	2 00
Buff Cochin, breeding pen, O. L. McCord, Danville, Ill.....	6 00
Second premium, Rainey Miller, Indianapolis, Ind.....	3 00
White Cochin cock, E. G. Roberts & Co., Fort Atkinson, Wis.....	1 50
Second premium, James A. Tucker, Concord, Mich.....	50
White Cochin hen, E. G. Roberts & Co., Fort Atkinson, Wis.....	1 50
Second premium, James A. Tucker, Concord, Mich.....	50
White Cochin cockerel, James A. Tucker, Concord, Mich.....	1 50

Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	50
White Cochín pullet, E. G. Roberts & Co., Fort Atkinson, Wis.....	1 50
Second premium, James A. Tucker, Concord, Mich.....	50
White Cochín, breeding pen, E. G. Roberts & Co., Fort Atkinson, Wis	4 00
Second premium, James A. Tucker, Concord, Mich.....	2 00
Black Cochín cock, E. G. Roberts & Co., Fort Atkinson, Wis.....	2 00
Second premium, B. F. Hill, Indianapolis, Ind.....	1 00
Black Cochín hen, B. F. Hill, Indianapolis, Ind.....	2 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	1 00
Black Cochín cockerel, Louis Seidensticker & Son, Brightwood, Ind	2 00
Second premium, B. F. Hill, Indianapolis, Ind.....	1 00
Black Cochín pullet, Louis Seidensticker & Son, Brightwood, Ind..	2 00
Second premium, Louis Seidensticker & Son, Brightwood, Ind.....	1 00
Black Cochín, breeding pen, B. F. Hill, Indianapolis, Ind.....	4 00
Second premium, Louis Seidensticker & Son, Brightwood, Ind.....	2 00
Partridge Cochín cock, Rainey Miller, Indianapolis, Ind.....	2 00
Second premium, Sid Conger, Hope, Ind.....	1 00
Partridge Cochín hen, E. G. Roberts & Co., Fort Atkinson, Wis....	2 00
Second premium, James A. Tucker, Concord, Mich.....	1 00
Partridge Cochín cockerel, Thos. H. Buck, Morristown, Ind.....	2 00
Second premium, Thos. H. Buck, Morristown, Ind.....	1 00
Partridge Cochín pullet, Sid Conger, Hope, Ind.....	2 00
Second premium, Sid Conger, Hope, Ind.....	1 00
Partridge Cochín, breeding pen, Sid Conger, Hope, Ind.....	5 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	3 00
Black Langshan cock, Ben S. Myers, Crawfordsville, Ind.....	3 00
Second premium, Rainey Miller, Indianapolis Ind.....	2 00
Black Langshan hen, Ben S. Myers, Crawfordsville, Ind.....	3 00
Second premium, Donald Harvey, Cambridge City, Ind.....	2 00
Black Langshan cockerel, N. L. Hutchinson, Crystal Springs, Miss.	3 00
Second premium, Ben S. Myers, Crawfordsville, Ind.....	2 00
Black Langshan pullet, Ben S. Myers, Crawfordsville, Ind.....	3 00
Second premium, Donald Harvey, Cambridge City, Ind.....	2 00
Black Langshan, breeding pen, Ben S. Myers, Crawfordsville, Ind..	8 00
Second premium, Ben S. Myers, Crawfordsville, Ind.....	4 00
White Langshan cock, E. G. Roberts & Co., Fort Atkinson, Wis...	1 00
Second premium, T. M. Smiley & Son, Milligan Ind.....	50
White Langshan hen, E. G. Roberts & Co., Fort Atkinson, Wis....	1 00
Second premium, T. M. Smiley & Son, Milligan, Ind.....	50
White Langshan cockerel, T. M. Smiley & Son, Milligan, Ind.....	1 00
Second premium, Sid Conger, Hope, Ind.....	50
White Langshan pullet, E. G. Roberts & Co., Fort Atkinson, Wis..	1 00
Second premium, Thos. H. Buck, Morristown, Ind.....	50

AMERICAN.

Barred Plymouth Rock cock, Sid Conger, Hope, Ind.....	3 00
Second premium, W. R. Zike & Sons, Morristown, Ind.....	2 00
Barred Plymouth Rock hen, Sid Conger, Hope, Ind.....	3 00
Second premium, W. R. Zike & Sons, Morristown, Ind.....	2 00
Barred Plymouth Rock cockerel, Sid Conger, Hope, Ind.....	3 00
Second premium, Ed B. Murphy, Connet. Ind.....	2 00
Barred Plymouth Rock pullet, Sid Conger, Hope, Ind.....	3 00
Second premium, Sid Conger, Hope, Ind.....	2 00
Barred Plymouth Rock, breeding pen, Sid Conger, Hope, Ind.....	8 00
Second premium, W. R. Zike & Sons, Morristown, Ind.....	4 00
White Plymouth Rock cock, U. R. Fishel, Hope, Ind.....	3 00
Second premium, R. M. Gand, Frankfort, Ind.....	2 00
White Plymouth Rock hen, R. M. Gand, Frankfort, Ind.....	3 00
Second premium, R. M. Gand, Frankfort, Ind.....	2 00
White Plymouth Rock cockerel, R. M. Gand, Frankfort, Ind.....	3 00
Second premium, Reeves & Jones, Clifford, Ind.....	2 00
White Plymouth Rock pullet, R. M. Gand, Frankfort, Ind.....	3 00
Second premium, R. M. Gand, Frankfort, Ind.....	2 00
White Plymouth Rock, breeding pen, R. M. Gand, Frankfort, Ind..	7 00
Second premium, Reeves & Jones, Clifford, Ind.....	3 00
Buff Plymouth Rock cock, E. G. Roberts & Co., Fort Atkinson, Wis	3 00
Second premium, F. E. Mow, Union Mills, Ind.....	2 00
Buff Plymouth Rock hen, F. E. Mow, Union Mills, Ind.....	3 00
Second premium, S. A. Moftzger, North Manchester, Ind.....	2 00
Buff Plymouth Rock cockerel, F. E. Mow, Union Mills, Ind.....	3 00
Second premium, Ed B. Murphy, Connet, Ind.....	2 00
Buff Plymouth Rock pullet, F. E. Mow, Union Mills, Ind.....	3 00
Second premium, F. E. Mow, Union Mills, Ind.....	2 00
Buff Plymouth Rock, breeding pen, F. E. Mow, Union Mills, Ind...	5 00
Second premium, F. L. Wright, Mount Healthy, Ohio.....	3 00
Buff Wyandotte cock, Wm. F. Volk, Columbus, Ohio.....	1 50
Second premium, F. E. Mow, Union Mills, Ind.....	1 00
Buff Wyandotte hen, W. C. Pierce, Indianapolis, Ind.....	1 50
Second premium, W. C. Pierce, Indianapolis, Ind.....	1 00
Buff Wyandotte cock, William F. Volk, Columbus, O.....	1 50
Second premium, F. E. Mow, Union Mills, Ind.....	1 00
Buff Wyandotte hen, W. C. Pierce, Indianapolis, Ind.....	1 50
Second premium, W. C. Pierce, Indianapolis, Ind.....	1 00
Buff Wyandotte cockerel, Riley & Hartough, Newport News, Ky...	1 50
Second premium, E. Saltmarsh & Co., Sunman, Ind.....	1 00
Buff Wyandotte pullet, Riley & Hartough, Newport News, Ky.....	1 50
Second premium, James A. Tucker, Concord, Mich.....	1 00
Buff Wyandotte, breeding pen, W. C. Pierce, Indianapolis, Ind....	4 00

Second premium, E. Saltmarsh & Co., Sunman, Ind.....	2 00
Silver Wyandotte cock, Mrs. George M. Hanly, Hoopeston, Ill.....	2 50
Second premium, Sid Conger, Hope, Ind.....	1 50
Silver Wyandotte hen, Mrs. George M. Hanly, Hoopeston, Ill.....	2 50
Second premium, Sid Conger, Hope, Ind.....	1 50
Silver Wyandotte cockerel, Mrs. George M. Hanly, Hoopeston, Ill..	2 50
Second premium, Sid Conger, Hope, Ind.....	1 50
Silver Wyandotte pullet, Sid Conger, Hope, Ind.....	2 50
Second premium, Mrs. George M. Hanly, Hoopeston, Ill.....	1 50
Silver Wyandotte, breeding pen, Sid Conger, Hope, Ind.....	5 00
Second premium, Mrs. George M. Hanly, Hoopeston, Ill.....	3 00
Golden Wyandotte cock, J. A. Horning & Son, Sunman, Ind.....	2 00
Second premium, Reeves & Jones, Clifford, Ind.....	1 00
Golden Wyandotte hen, Reeves & Jones, Clifford, Ind.....	2 00
Second premium, Reeves & Jones, Clifford, Ind.....	1 00
Golden Wyandotte cockerel, E. G. Roberts & Co., Fort Atkinson, Wis	2 00
Second premium, B. F. Hislot, Millford, Ill.....	1 00
Golden Wyandotte pullet, J. A. Horning & Sons, Sunman, Ind.....	2 00
Second premium, Reeves & Jones, Clifford, Ind.....	1 00
Golden Wyandotte, breeding pen, Reeves & Jones, Clifford, Ind....	5 00
Second premium, Rainey Miller, Indianapolis, Ind.....	3 00
White Wyandotte cock, Ed L. May, Indianapolis, Ind.....	2 50
Second premium, E. G Roberts & Co, Fort Atkinson, Wis.....	1 50
White Wyandotte hen, Ed L May, Indianapolis, Ind.....	2 50
Second premium, Reeves & Jones, Clifford, Ind.....	1 50
White Wyandotte cockerel, William F. Volk, Columbus, Ohio.....	2 50
Second premium, W. C. Pierce, Indianapolis, Ind.....	1 50
White Wyandotte pullet, W. C. Pierce, Indianapolis, Ind.....	2 50
Second premium, William F. Volk, Columbus, Ohio.....	1 50
White Wyandotte, breeding pen, Ed L. May, Indianapolis, Ind....	5 00
Second premium, W. C. Pierce, Indianapolis, Ind.....	3 00
Black Java, cock or cockerel, E. G. Roberts & Co., Fort Atkinson, Wis	1 00
Second premium, William F. Volk, Columbus, Ohio.....	50
Black Java, hen or pullet, E. G. Roberts & Co., Fort Atkinson, Wis	1 00
Second premium, Mrs. R. W. Williams, Indianapolis, Ind.....	50

LEGHORN.

White cock (S. C.), William Tobin, Indianapolis, Ind.....	3 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	2 00
White hen (S. C.), Riley & Hartough, Newport News, Ky.....	3 00
Second premium, William Tobin, Indianapolis, Ind.....	2 00
White cockerel (S. C.), Fred Gresh, Zionsville, Ind.....	3 00
Second premium, Riley & Hartough, Newport News, Ky.....	2 00

White pullet (S. C.), Riley & Hartough, Newport News, Ky.....	3 00
Second premium, Fred Gresh. Zionsville, Ind.....	2 00
White (S. C.). breeding pen. William Tobin, Indianapolis, Ind.....	6 00
Second premium, Riley & Hartough, Newport News, Ky.....	3 00
White cock (R. C.), W. O. Swaine, Manilla, Ind.....	2 00
Second premium, William F. Volk, Columbus, Ohio.....	1 00
White hen (R. C.), T. M. Smiley & Son, Milligan, Ind.....	2 00
Second premium, W. O. Swaine, Manilla, Ind.....	1 00
White cockerel (R. C.), Willie Tucke, Indianapolis, Ind.....	2 00
Second premium, James A. Tucker, Concord, Mich.....	1 00
White pullet (R. C.), E. G. Roberts & Co., Fort Atkinson, Wis.....	2 00
Second premium, James A. Tucker, Concord, Mich.....	1 00
Brown cock (S. C.), E. G. Roberts & Co., Fort Atkinson, Wis.....	3 00
Second premium, W. O. Swaine, Manilla, Ind.....	2 00
Brown hen (S. C.), E. G. Roberts & Co., Fort Atkinson, Wis.....	3 00
Second premium, S. B. Lane, Spiceland, Ind.....	2 00
Brown cockerel (S. C.), Ed B. Murphy, Connet, Ind.....	3 00
Second premium, Ed B. Murphy, Connet, Ind.....	2 00
Brown pullet, (S. C.), Ed B. Murphy, Connet, Ind.....	3 00
Second premium, W. O. Swaine, Manilla, Ind.....	2 00
Brown, (S. C.), breeding pen, Ed B. Murphy. Connet, Ind.....	8 00
Second premium, W. O. Swaine, Manilla, Ind.....	4 00
Brown cock (R. C.), E. G. Roberts & Co., Fort Atkinson, Wis.....	2 00
Second premium, T. M. Smiley & Son, Milligan, Ind.....	1 00
Brown hen (R. C.), T. M. Smiley & Son, Milligan, Ind.....	2 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	1 00
Brown cockerel (R. C.), N. L. Hutchinson, Crystal Springs, Miss...	2 00
Second premium, C. R. Milhous, Indianapolis, Ind.....	1 00
Brown pullet (R. C.), N. L. Hutchinson, Crystal Springs, Miss.....	2 00
Second premium, C. R. Milhous, Indianapolis, Ind.....	1 00
Buff cock. E. G. Roberts & Co., Fort Atkinson, Wis.....	2 00
Second premium, Rainey Miller, Indianapolis, Ind.....	1 00
Buff hen, E. G. Roberts & Co., Fort Atkinson, Wis.....	2 00
Second premium, Miss C. M. Onvin & Co., Logansport, Ind.....	1 00
Buff cockerel. B. F. Hislott, Millford, Ill.....	2 00
Second premium, James A. Tucker, Concord, Mich.....	1 00
Buff pullet, E. G. Roberts & Co., Fort Atkinson, Wis.....	2 00
Second premium, James A. Tucker, Concord, Mich.....	1 00
Buff, breeding pen, E. G. Roberts & Co., Fort Atkinson, Wis.....	5 00
Second premium, Rainey Miller, Indianapolis, Ind.....	3 00
Black cock or cockerel, Rainey Miller, Indianapolis, Ind.....	1 00
Second premium, Rainey Miller, Indianapolis, Ind.....	5 00
Black hen or pullet, J. A. Horning & Sons, Sunman, Ind.....	1 00
Second premium, James A. Tucker, Concord, Mich.....	50

HOUDAN.

Cock, J. P. Baxla, Anthony, Ind.....	2 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	1 00
Hen, E. G. Roberts & Co., Fort Atkinson, Wis.....	2 00
Second premium, J. B. Baxla, Anthony, Ind.....	1 00
Cockerel, James A. Tucker, Concord, Mich.....	2 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	1 00
Pullet, James A. Tucker, Concord, Mich.....	2 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	1 00
Breeding pen, J. P. Baxla, Anthony, Ind.....	4 00
Second premium, Ed L. May, Indianapolis, Ind.....	2 00

BLACK SPANISH

Cock, Louis Seidensticker & Son, Brightwood, Ind.....	2 00
Second premium, Ed L. May, Indianapolis, Ind.....	1 00
Hen, Rainey Miller, Indianapolis, Ind.....	2 00
Second premium, Rainey Miller, Indianapolis, Ind.....	1 00
Cockerel, J. A. Horning & Sons, Sunman, Ind.....	2 00
Second premium, Rainey Miller, Indianapolis, Ind.....	1 00
Pullet, Rainey Miller, Indianapolis, Ind.....	2 00
Second premium, J. A. Horning & Sons, Indianapolis, Ind.....	1 00

MINORCA.

Black cock, J. A. Horning & Sons, Indianapolis, Ind.....	2 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	1 00
Black hen, E. G. Roberts & Co., Fort Atkinson, Wis.....	2 00
Second premium, J. A. Horning & Sons, Indianapolis, Ind.....	1 00
Black cockerel, J. A. Horning & Sons, Indianapolis, Ind.....	2 00
Second premium, Ed L. May, Indianapolis, Ind.....	1 00
Black pullet, Ed L. May, Indianapolis, Ind.....	2 00
Second premium, J. A. Horning & Sons, Sunman, Ind.....	1 00
Black, breeding pen, J. A. Horning & Sons, Sunman, Ind.....	4 00
Second premium, W. O. Swain, Manilla, Ind.....	2 00
White cock or cockerel, H. D. Lane, Indianapolis, Ind.....	1 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	50
White hen or pullet, H. D. Lane, Indianapolis, Ind.....	1 00
Second premium, H. D. Lane, Indianapolis, Ind.....	50

HAMBURG.

Golden-spangled cock, Thos. H. Buck, Morristown, Ind.....	1 00
Second premium, William F. Volk, Columbus, Ohio.....	50
Golden-spangled hen, Thos. H. Buck, Morristown, Ind.....	1 00
Second premium, William F. Volk, Columbus, Ohio.....	50
Golden-spangled cockerel, E. G. Roberts & Co., Fort Atkinson, Wis.....	1 00

Golden-spangled pullet, E. G. Roberts & Co., Fort Atkinson, Wis..	1 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	50
Silver-spangled cock, Thomas H. Buck, Morristown, Ind.....	1 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	50
Silver-spangled hen, Thomas H. Buck, Morristown, Ind.....	1 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	50
Silver-spangled cockerel, E. G. Roberts & Co., Fort Atkinson, Wis.	1 00
Second premium, Thomas H. Buck, Morristown, Ind.....	50
Silver-spangled pullet, Thomas H. Buck, Morristown, Ind.....	1 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	50
Silver-spangled, breeding pen, Thomas H. Buck, Morristown, Ind..	4 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	2 00
Golden-penciled cock or cockerel, E. G. Roberts & Co., Fort Atkin- son, Wis	1 00
Second premium, William F. Volk, Columbus, Ohio.....	50
Golden-penciled hen or pullet, E. G. Roberts & Co., Fort Atkinson, Wis	1 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	50
Silver-penciled cock or cockerel, E. G. Roberts & Co., Fort Atkin- son, Wis	1 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	50
Silver-penciled hen or pullet, E. G. Roberts & Co., Fort Atkinson, Wis	1 00
Second premium, William F. Volk, Columbus, Ohio.....	50

POLISH

White-crested black cock, E. G. Roberts & Co., Fort Atkinson, Wis	1 00
Second premium, James A. Tucker, Concord, Mich.....	50
White-crested black hen, E. G. Roberts & Co., Fort Atkinson, Wis.	1 00
Second premium, Thomas H. Buck, Morristown, Ind.....	50
White-crested black cockerel, E. G. Roberts & Co., Fort Atkinson, Wis	1 00
Second premium, John L. Marsh, Brownsburg, Ind.....	50
White-crested black pullet, E. G. Roberts & Co., Fort Atkinson, Wis	1 00
Second premium, Thomas H. Buck, Morristown, Ind.....	50
White-crested, breeding pen, Thomas H. Buck, Morristown, Ind...	4 00
Second premium, John L. Marsh, Brownsburg, Ind.....	2 00
Golden (plain or bearded) cock or cockerel, E. G. Roberts & Co., Fort Atkinson, Wis.....	1 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	50
Golden (plain or bearded) hen or pullet, E. G. Roberts & Co., Fort Atkinson, Wis	1 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	50

Silver (plain or bearded) cock, E. G. Roberts & Co., Fort Atkinson, Wis	1 00
Second premium, Thomas H. Buck, Morristown, Ind.....	50
Silver (plain or bearded) hen, E. G. Roberts & Co., Fort Atkinson, Wis	1 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	50
Silver (plain or bearded) cockerel, Thomas H. Buck, Morristown Ind	1 00
Second premium, James A. Tucker, Concord, Mich.....	50
Silver (plain or bearded) pullet, James A. Tucker, Concord, Mich..	1 00
Second premium, James A. Tucker, Concord, Mich.....	50
Silver (plain or bearded), breeding pen, E. G. Roberts & Co., Fort Atkinson, Wis	3 00
Second premium, Thomas H. Buck, Morristown, Ind.....	2 00

DORKING.

Any color cock or cockerel, E. G. Roberts & Co., Fort Atkinson, Wis	1 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	50
Any color hen or pullet, G. R. Baxter, Hillsdale, Mich.....	1 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	50

RED-CAP.

Cock, William F. Volk, Columbus, Ohio.....	1 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	50
Hen, William F. Volk, Columbus, Ohio.....	1 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	50
Cockerel, E. G. Roberts & Co., Fort Atkinson, Wis.....	1 00
Second premium, Moorman & Brown Co., Castle, Ind.....	50
Pullet, Moorman & Brown Co., Castle, Ind.....	1 00
Second premium, Moorman & Brown Co., Castle, Ind.....	50
Breeding pen, Abe Rees, Bunker Hill, Ind.....	4 00
Second premium, Moorman & Brown Co., Castle, Ind.....	2 00
Black-breasted red cock, F. L. Wright, Mount Healthy, Ohio.....	2 00
Second premium, H. D. Lane, Indianapolis, Ind.....	1 00
Black-breasted red hen, Wesley Lanins, Greensburg, Ind.....	2 00
Second premium, F. L. Wright, Mound Healthy, Ohio.....	1 00
Black-breasted red cockerel, F. L. Wright, Mount Healthy, Ohio...	2 00
Second premium, Wesley Lanins, Greensburg, Ind.....	1 00
Black-breasted red pullet, F. L. Wright, Mount Healthy, Ohio.....	2 00
Second premium, F. L. Wright, Mount Healthy, Ohio.....	1 00
Black-breasted red, breeding pen, F. L. Wright, Mount Healthy, Ohio	4 00
Second premium, Wesley Lanins, Greensburg Ind.....	2 00

Red Pile cock or cockerel, Wesley Lanins, Greensburg, Ind.....	1 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	50
Red Pile hen or pullet, E. G. Roberts & Co., Fort Atkinson, Wis...	1 00
Second premium, Wesley Lanins, Greensburg, Ind.....	50
White cockerel, E. G. Roberts & Co., Fort Atkinson, Wis.....	1 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	50
White pullet, E. G. Roberts & Co., Fort Atkinson, Wis.....	1 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	50
Cornish Indian cock, E. R. Moody, Eminence, Ky.....	2 00
Second premium, Wesley Lanins, Greensburg, Ind.....	1 00
Cornish Indian hen, E. G. Roberts & Co., Fort Atkinson, Wis.....	2 00
Second premium, E. R. Moody, Eminence, Ky.....	1 00
Cornish Indian cockerel, Rainey Miller, Indianapolis, Ind.....	2 00
Second premium, F. M. Smiley & Son, Milligan, Ind.....	1 00
Cornish Indian pullet, Rainey Miller, Indianapolis, Ind.....	2 00
Second premium, Wesley Lanins, Greensburg, Ind.....	1 00
Cornish Indian, breeding pen, Wesley Lanins, Greensburg, Ind....	4 00

BANTAMS—SEABRIGHTS.

Golden cock, Sid Conger, Hope, Ind.....	1 00
Second premium, James A. Tucker, Concord, Mich.....	50
Golden hen, B. F. Hill, Indianapolis, Ind.....	1 00
Second premium, Sid Conger, Hope, Ind.....	50
Golden cockerel, E. G. Roberts & Co., Fort Atkinson, Wis.....	1 00
Second premium, Reeves & Jones, Clifford, Ind.....	50
Golden pullet, Reeves & Jones, Clifford, Ind.....	1 00
Second premium, James A. Tucker, Concord, Mich.....	50
Golden, breeding pen, Reeves & Jones, Clifford, Ind.....	2 00
Second premium, Sid Conger, Hope, Ind.....	1 00
Silver cock or cockerel, G. R. Baxter, Hillsdale, Mich.....	1 00
Second premium, Sid Conger, Hope, Ind.....	50
Silver hen or pullet, J. A. Horning & Sons, Sunman, Ind.....	1 00
Second premium, Reeves & Jones, Clifford, Ind.....	50
Japanese cock or cockerel, in colors, G. R. Baxter, Hillsdale, Mich.	1 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	50
Japanese hen or pullet (in colors), E. G. Roberts & Co., Fort Atkin- son, Wis.....	1 00
Second premium, G. R. Baxter, Hillsdale, Mich.....	50
Rose, C. B., cock or cockerel, E. G. Roberts & Co., Fort Atkinson, Wis.	1 00
Second premium, E. G. Roberts & Co., Fort Atkinson, Wis.....	50
Rose, C. B., hen or pullet, E. G. Roberts & Co., Fort Atkinson, Wis.	1 00
Second premium, G. R. Baxter, Hillsdale, Mich.....	50

GAME BANTAMS.

Black-breasted red cock, Melroy & Catt, Butler, Ind.....	1 00
Second premium, J. A. Horning & Sons, Sunman, Ind.....	50
Black-breasted red hen, Melroy & Catt, Butler, Ind.....	1 00
Second premium, R. R. Voris, Peoria, Ill.....	50
Black-breasted red cockerel, Melroy & Catt, Butler, Ind.....	1 00
Second premium, S. A. Moftzger, North Manchester, Ind.....	50
Black-breasted red pullet, R. R. Voris, Peoria, Ill.....	1 00
Second premium, Melroy & Catt, Butler, Ind.....	50
Black-breasted red, breeding pen, Melroy & Catt, Butler, Ind.....	3 00
Second premium, R. R. Voris, Peoria, Ill.....	2 00
Silver duckwing cock, Melroy & Catt, Butler, Ind.....	1 00
Second premium, E. G. Robert & Co., Ft. Atkinson, Wis.....	50
Silver duckwing hen, E. G. Robert & Co., Ft. Atkinson, Wis.....	1 00
Second premium, Melroy & Catt, Butler, Ind.....	50
Silver duckwing cockerel, Sid Conger, Hope, Ind.....	1 00
Second premium, B. F. Duncan, Greenfield, Ind.....	50
Silver duckwing pullet, Sid Conger, Hope, Ind.....	1 00
Second premium, Frank R. Hale, Shelbyville, Ind.....	50
Red pile, cock or cockerel, Wesley Lanins, Greensburg, Ind.....	1 00
Second premium, G. R. Baxter, Hillsdale, Mich.....	50
Red pile, hen or pullet, E. G. Roberts & Co., Ft. Atkinson, Wis....	1 00
Second premium, Melroy & Catt, Butler, Ind.....	50
Brown red, cock or cockerel, E. G. Roberts & Co., Ft. Atkinson, Wis.	1 00
Second premium, William F. Volk, Columbus, O.....	50
Brown red, hen or pullet, E. G. Roberts & Co., Ft. Atkinson, Wis.	1 00
Second premium, William F. Volk, Columbus, O.....	50

BUFF COCHIN—BANTAMS.

Cock, W. R. Zike & Sons, Morristown, Ind.....	1 00
Second premium, F. E. Mow, Union Mills, Ind.....	50
Hen, Allen Bros., Lamong, Ind.....	1 00
Second premium, W. R. Zike & Sons, Morristown, Ind.....	50
Cockerel, James A. Tucker, Concord, Mich.....	1 00
Second premium, G. R. Baxter, Hillsdale, Mich.....	50
Pullet, J. J. Vance, Springport, Ind.....	1 00
Second premium, James A. Tucker, Concord, Mich.....	50
Breeding pen, W. R. Zike & Sons, Morristown, Ind.....	2 00
Second premium, J. J. Vance, Springport, Ind.....	1 00

TURKEYS

Bronze cock, R. L. Bratton, New Ross, Ind.....	3 00
Second premium, B. F. Ulrey, New Richmond, Ind.....	2 00

Bronze hen, B. F. Ulery, New Richmond, Ind.....	3 00
Second premium, B. F. Hislop, Millford, Ill.....	2 00
Bronze cockerel, B. F. Ulery, New Richmond, Ind.....	3 00
Second premium, B. F. Hislop, Millford, Ill.....	2 00
Bronze pullet, B. F. Ulery, New Richmond, Ind.....	3 00
Second premium, B. F. Hislop, Millford, Ill.....	2 00
White Holland cock, Luther Gardner, Fincastle, Ind.....	3 00
Second premium, Luther Gardner, Fincastle, Ind.....	2 00
White Holland hen, Jas. A. Tucker, Concord, Mich.....	3 00
Second premium, W. C. Jackson, South Bend, Ind.....	2 00
White Holland cockerel, Luther Gardner, Fincastle, Ind.....	3 00
Second premium, Luther Gardner, Fincastle, Ind.....	2 00
White Holland pullet, Luther Gardner, Fincastle, Ind.....	3 00
Second premium, Luther Gardner, Fincastle, Ind.....	2 00
Buff cock. No premiums awarded.	
Buff cockerel, G. R. Baxter, Hillsdale, Mich.....	2 00
Second premium, Leonard Bros., Gem, Ind.....	1 00
Buff hen, G. R. Baxter, Hillsdale, Mich.....	2 00
Second premium. No premium awarded.	
Buff pullet, G. R. Baxter, Hillsdale, Mich.....	2 00
Second premium, Leonard Bros., Gem, Ind.....	1 00

GEESE.

Pair of Toulouse, old, E. G. Roberts & Co., Ft. Atkinson, Wis.....	3 00
Second premium, B. F. Hislop, Millford, Ill.....	2 00
Pair of Toulouse, young, B. F. Hislop, Millford, Ill.....	3 00
Second premium, U. B. Fishel, Hope, Ind.....	2 00
Pair of Embden, old, Clayton M. Kelley, Greencastle, Ind.....	3 00
Second premium, F. M. Smiley & Son, Milligan, Ind.....	2 00
Pair of Embden, young, Leonard Bros., Gem, Ind.....	3 00
Second premium, J. S. Smiley & Son, Parkersville, Ind.....	2 00
Pair of Brown Chinese, old or young, E. G. Roberts & Co., Ft. Atkinson, Wis.....	2 00
Second premium, J. A. Horning & Sons, Sunman, Ind.....	1 00
Pair of White Chinese, old or young, E. G. Roberts & Co., Ft. Atkinson, Wis.....	2 00
Second premium, J. P. Baxla, Anthony, Ind.....	1 00
Pair Wild, J. A. Horning & Sons, Sunman, Ind.....	1 00
Second premium, E. G. Roberts & Co., Ft. Atkinson, Wis.....	50

DUCKS.

Pair Pekin, old, Frank G. Hogan, O'Bannon, Ky.....	3 00
Second premium, Thos. H. Buck, Morristown, Ind.....	2 00
Pair Pekin, young, Reeves & Jones, Clifford, Ind.....	3 00

Second premium, S. M. Williams, Monroeville, Ind.....	2 00
Pair Aylesbury, old or young, E. G. Roberts & Co., Ft. Atkinson, Wis.	3 00
Second premium, Wm. F. Volk, Columbus, O.....	2 00
Pair Rouen, old, J. S. Smiley & Son, Parkerville, Ind.....	3 00
Second premium, E. G. Roberts & Co., Ft. Atkinson, Wis.....	2 00
Pair Rouen, young, J. P. Baxla, Anthony, Ind.....	3 00
Second premium. No premium awarded.	

PIDGEONS.

Best display of Pouters, Ed. L. May, 1516 N. Rural St., Indian- apolis, Ind.....	2 00
Second premium, David F. Swain, 1916 N. Alabama St., Indian- apolis, Ind.....	1 00
Best display of Carriers, Ed. L. May, 1516 N. Rural St., Indian- apolis, Ind.....	2 00
Second premium. No premium awarded.	
Best display of Barbs. No premium awarded.	
Best display of Fantails, Ed. L. May, 1516 N. Rural St., Indian- apolis, Ind.....	2 00
Second premium, David F. Swain, 1916 N. Alabama St., Indian- apolis, Ind.....	1 00
Best display of Jacobins. No premiums awarded.	
Best display of Turbits, Ed. L. May, 1516 N. Rural St., Indian- apolis, Ind.....	2 00
Second premium. No premium awarded.	
Best display of Magpies, Ed. L. May, 1516 N. Rural St., Indian- apolis, Ind.....	2 00
Second premium. No premium awarded.	
Best display of Swallows, Ed. L. May, 1516 N. Rural St., Indian- apolis, Ind.....	2 00
Second premium, Oscar Finkbine, 1521 Byram Place, Indianapolis, Ind.	1 00
Best display of Owls, Ed. L. May, 1516 N. Rural St., Indianapolis, Ind.	2 00
Second premium, Oscar Finkbine, 1521 Byram Place, Indianapolis, Ind.	1 00
Best display of Antwerps, Ed. L. May, 1516 N. Rural St., Indian- apolis, Ind.....	2 00
Second premium. No premium awarded.	
Best display of Tumblers, Ed. L. May, 1516 N. Rural St., Indian- apolis, Ind.....	2 00
Second premium, Neal Price, 3724 N. Illinois St., Indianapolis, Ind.	1 00

RABBITS.

Best pair Lop-eared, any color. No premiums awarded.

Best pair Belgian or German, T. H. Harris & Co., Berne, Ind. 2 00

Second premium, T. H. Harris & Co., Berne, Ind. 1 00

Best pair Himalayans. No premiums awarded.

DEPARTMENT H. DAIRY AND CREAMERY PRODUCTS.

CLASS XXXVI.

For the best 30-pound tub of creamery butter, Herbert Newby,

Spiceland, Ind. \$20 00

Second premium. No premium awarded.

Consolation prize divided—

Henry Larson, Dodgeville, Wis. 15 27

Herbert Newby, Spiceland, Ind. 12 36

W. T. S. Bray, Westfield, Ind. 12 36

Best 15-pound tub of dairy butter, Peter Raab, Brightwood, Ind. . 20 00

Second premium. No premium awarded.

Consolation prize divided—

Mrs. A. O. Sample, Greenfield, Ind. 4 40

A. F. Ward, Thorntown, Ind. 6 61

Mrs. Jerome Dunlap, Lafayette, Ind. 2 94

Bettie Clore, Bargersville, Ind. 6 98

Wm. J. Raab, Brightwood, Ind. 6 61

E. Saltmarsh & Co., Sunman, Ind. 4 04

A. B. Steidley, Carlisle, Ill. 8 54

Best 5 pounds dairy butter, A. F. Ward, Thorntown, Ind. 12 00

Second premium, Bettie Clore, Bargersville, Ind. 8 00

Third premium, Mrs. E. T. Drake, Edinburg, Ind. 4 00

Best 5 pounds dairy butter made by girl under twenty, Hilda Ward,
Thorntown, Ind. 12 00

Second premium, Rosa Spires, 2501 Station B., Indianapolis, Ind. . 8 00

Third premium, Lulu Garretson, Pendleton, Ind. 4 00

Best 5 pounds dairy butter made by a graduate of a dairy school,
Mrs. Cora Banons Edmunds, 3236 N. Illinois St., Indianapolis,
Ind. 12 00

Second premium. No premium awarded.

Third premium. No premium awarded.

Best full cream cheese, not less than 30 pounds, W. L. McCain,
Hortonville, Ind. 15 00

Second premium, Boyd Drischel, Cambridge City, Ind.....	10 00
Third premium, Groveland Cheese Co., Dana, Ill.....	5 00
Best full cream cheese, not less than 30 pounds, made by factory located in Indiana, Boyd Drischel, Cambridge City, Ind.....	15 00
Second premium. No premium awarded.	
Third premium. No premium awarded.	
Best three Young Americas full cream cheese, not less than 10 pounds each, made by factory located in Indiana, Boyd Drischel, Cambridge City, Ind.....	8 00
Second premium. No premium awarded.	
Third premium. No premium awarded.	
Best cottage cheese, not less than 1 pint, Mrs. W. B. Flick, Law- rence, Ind.....	8 00
Second premium, Bettie Clore, Bargersville, Ind.....	6 00
Third premium, Mrs. J. L. Drake, Beech Grove, Ind.....	4 00

DEPARTMENT I. AGRICULTURAL.

CLASS XXXVII—Grain and Seeds.

Twenty ears yellow corn, L. B. Clore, Franklin, Ind.....	\$5 00
Second premium, C. A. Brown, Franklin, Ind.....	2 00
Twenty ears white corn, J. D. Whitesides, Franklin, Ind.....	5 00
Second premium, C. A. Brown, Franklin, Ind.....	2 00
Twenty ears of any other variety, J. D. Whitesides, Franklin, Ind.	5 00
Second premium, Harry Bennett, Franklin, Ind.....	2 00
Twenty ears white flint hominy corn, Whipps Bros., Marion, O....	5 00
Second premium, J. R. Overstreet, Franklin, Ind.....	2 00
One peck white rick popcorn, John Marvel, Royalton, Ind.....	2 00
Second premium, J. D. Whitesides, Franklin, Ind.....	1 00
One peck golden popcorn, John Marvel, Royalton, Ind.....	2 00
Second premium, F. M. Sandford, Philadelphia, Ind.....	1 00
One peck any other variety of popcorn, W. F. Tracy, Rising Sun, Ind.	2 00
Second premium, J. L. Keckley, Marysville, O.....	1 00
Best display and variety of corn, L. B. Clore, Franklin, Ind.....	20 00
Second premium, J. R. Overstreet, Franklin, Ind.....	10 00
Best half bushel white winter wheat, J. L. Keckley, Marysville, O.	4 00
Second premium, Whipps Bros., Marion, O.....	2 00
Best half bushel red winter wheat, F. M. Sandford, Philadelphia, Ind.	4 00

Second premium, J. L. Keckley, Marysville, O.....	2 00
Best half bushel Fultz wheat, Geo. M. Rumler, Mohawk, Ind.....	4 00
Second premium, F. M. Sandford, Philadelphia, Ind.....	2 00
Best half bushel red spring wheat, J. L. Keckley, Marysville, O..	4 00
Second premium, J. L. Keckley, Marysville, Ohio.....	2 00
Best display wheat, Geo. M. Rumler, Mohawk, Ind.....	10 00
Second premium, John Marvel, Royalton, Ind.....	5 00
Best display of grain in the straw, Whipps Bros., Marion, O.....	5 00
Second premium, J. L. Keckley, Marysville, O.....	3 00
Best display of meadow and pasture grasses, Whipps Bros., Ma- rion, O.....	8 00
Second premium, J. L. Keckley, Marysville, O.....	4 00
Half bushel rye, J. L. Keckley, Marysville, O.....	2 00
Second premium, J. L. Keckley, Marysville, O.....	1 00
Half bushel white oats, J. L. Keckley, Marysville, O.....	2 00
Second premium, J. L. Keckley, Marysville, O.....	1 00
Half bushel black oats, Whipps Bros., Marion, O.....	2 00
Second premium, J. L. Keckley, Marysville, O.....	1 00
Half bushel rust proof oats, John Marvel, Royalton, Ind.....	2 00
Second premium, F. M. Sandford, Philadelphia, Ind.....	1 00
Half bushel silver hull buckwheat, J. L. Keckley, Marysville, O..	2 00
Second premium, John Marvel, Royalton, Ind.....	1 00
Half bushel barley, Whipps Bros., Marion, O.....	2 00
Second premium, J. L. Keckley, Marysville, O.....	1 00
Half bushel millet seed, Whipps Bros., Marion, O.....	2 00
Second premium, J. R. Overstreet, Franklin, Ind.....	1 00
Half bushel timothy seed, F. M. Sandford, Philadelphia, Ind.....	2 00
Second premium, J. R. Overstreet, Franklin, Ind.....	1 00
Half bushel orchard grass seed, Whipps Bros., Marion, O.....	2 00
Second premium, John Marvel, Royalton, Ind.....	1 00
Half bushel Hungarian grass seed, Whipps Bros., Marion, O.....	2 00
Second premium, John Marvel, Royalton, Ind.....	1 00
Half bushel Kentucky blue grass seed, J. L. Keckley, Marysville, O.	2 00
Second premium, Whipps Bros., Marion, O.....	1 00
Half bushel Mammoth clover seed, F. M. Sandford, Philadelphia, Ind.	2 00
Second premium, J. D. Whitesides, Franklin, Ind.....	1 00
Half bushel red clover seed, J. R. Overstreet, Franklin, Ind.....	2 00
Second premium, F. M. Sandford, Philadelphia, Ind.....	1 00
Best display and collection of grain and seed grown by exhibitor, seed of 1899, J. L. Keckley, Marysville, O.....	8 00
Second premium, Whipps Bros., Marion, O.....	4 00
Best display and collection of farm products by Indiana county or society, John Marvel, Royalton, Ind.....	50 00
Second premium, J. D. Whitesides, Franklin, Ind	25 00

Collection of grasses, Whipps Bros., Marion, O.....	Diploma
Half bushel flaxseed, John Marvel, Royalton, Ind.....	2 00
Second premium, J. D. Whitesides, Franklin, Ind.....	1 00

CLASS XXXVIII—Vegetables.

Three white egg plants, no premium awarded.	
Second premium, no premium awarded.	
Three New York egg plants, Becker & Becker, Mapleton, Ind.....	\$2 00
Second premium, Chas. E. Becker, Mapleton, Ind.....	1 00
Twelve best cucumbers, D. Ellivanger, 1011 Tremont Avenue, Indianapolis, Ind.....	2 00
Second premium, Becker & Becker, Mapleton, Ind.....	1 00
Six cauliflowers, Chas. Giesking, Mapleton, Ind.....	2 00
Second premium, John Marvel, Royalton, Ind.....	1 00
Twelve ears late sweet corn, John Marvel, Royalton, Ind.....	2 00
Second premium, Whipps Bros., Marion, Ohio.....	1 00
Twelve ears early sweet corn, Whipps Bros., Marion, Ohio.....	2 00
Second premium, John Marvel, Royalton, Ind.....	1 00
Three Hubbard squash, Whipps Bros., Marion Ohio.....	2 00
Second premium, J. L. Keckley, Marysville, Ohio.....	2 00
Three Boston marrow squash, Whipps Bros., Marion, Ohio.....	2 00
Second premium, no second premium awarded.	
Three Marblehead squash, J. L. Keckley, Marysville, Ohio.....	2 00
Second premium, John Marvel, Royalton, Ind.....	1 00
Three red Hubbard squash, J. L. Keckley, Marysville, Ohio.....	2 00
Second premium, John Marvel, Royalton, Ind.....	1 00
Three Kershaw squash, L. B. Clore, Franklin, Ind.....	2 00
Second premium, J. F. Eller, Castleton, Ind.....	1 00
Three field pumpkins, John Marvel, Royalton, Ind.....	2 00
Second premium, Harry Bennett, Franklin, Ind.....	1 00
Largest squash, J. D. Whitesides, Franklin, Ind.....	2 00
Second premium, no premium awarded.	
Largest pumpkin, John Marvel, Royalton, Ind.....	2 00
Second premium, J. Snyder, Southport, Ind.....	1 00
Six drumhead cabbages, Chas. Giesking, Mapleton, Ind.....	2 00
Second premium, John Marvel, Royalton, Ind.....	1 00
Six flat Dutch cabbages, John Marvel, Royalton, Ind.....	2 00
Second premium, D. Ellivanger, 1011 Tremont Avenue, Indianapolis, Ind.....	1 00
Six early cabbages, D. Ellivanger, 1011 Tremont Avenue, Indianapolis, Ind	2 00
Second premium, John Marvel, Royalton, Ind.....	1 00
Six red cabbages, Becker & Becker, Mapleton, Ind.....	2 00

Second premium, Chas. E. Becker, Mapleton, Ind.....	1 00
Twelve stocks of celery, D. Ellivanger, 1011 Tremont Avenue, Indianapolis, Ind.....	2 00
Second premium, Becker & Becker, Mapleton, Ind.....	1 00
Best display of celery, D. Ellivanger, 1011 Tremont Avenue, Indianapolis, Ind.....	3 00
Second premium, D. Ellivanger, 1011 Tremont Avenue, Indianapolis, Ind	2 00
Half peck Lima beans, Geo. M. Rumler, Mohawk, Ind.....	2 00
Second premium, John Marvel, Royalton, Ind.....	1 00
Half peck white marrowfat beans, Whipps Bros., Marion, Ohio....	2 00
Second premium, Geo. M. Rumler, Mohawk, Ind.....	1 00
Half peck white navy beans, Geo. M. Rumler, Mohawk, Ind.....	2 00
Second premium, Whipps Bros., Marion, Ohio.....	1 00
Half peck colored kidney beans, Whipps Bros., Marion, Ohio....	2 00
Second premium, J. L. Keckley, Marysville, Ohio.....	1 00
Half peck white kidney beans, J. L. Keckley, Marysville, Ohio....	2 00
Second premium, J. J. Vance, Springport, Ind.....	1 00
Half peck garden peas, dry, Whipps Bros., Marion, Ohio.....	2 00
Second premium, John Marvel, Royalton, Ind.....	1 00
Best peck purple tomatoes, D. Ellivanger, 1011 Tremont Avenue, Indianapolis, Ind.....	2 00
Second premium, Whipps Bros., Marion, Ohio.....	1 00
Best peck Stone tomatoes, Chas. Giesking, Mapleton, Ind.....	2 00
Second premium, Becker & Becker, Mapleton, Ind.....	1 00
Best peck yellow tomatoes, D. Ellivanger, 1011 Tremont Avenue, Indianapolis, Ind.....	2 00
Second premium, Chas. Giesking, Mapleton, Ind.....	1 00
Collection of tomatoes, ten varieties, D. Ellivanger, 1011 Tremont Avenue, Indianapolis, Ind.....	3 00
Second premium, Chas. E. Becker, Mapleton, Ind.....	1 00
Six nutmeg melons, D. Ellivanger, 1011 Tremont Avenue, Indianapolis, Ind	2 00
Second premium, Becker & Becker, Mapleton, Ind.....	1 00
Six muskmelons, Chas. E. Becker, Mapleton, Ind.....	2 00
Second premium, D. Ellivanger, 1011 Tremont Avenue, Indianapolis, Ind	1 00
Six Gypsy watermelons, J. S. Duckwall, 1914 Capitol Avenue, Indianapolis, Ind.....	2 00
Second premium, Chas. E. Becker, Mapleton, Ind.....	1 00
Six Sweetheart melons, D. Ellivanger, 1011 Tremont Avenue, Indianapolis, Ind	2 00
Second premium, Chas. E. Becker, Mapleton, Ind.....	1 00
Six white icing melons, J. S. Duckwall, 1914 Capitol Avenue N., Indianapolis, Ind.....	2 00

Second premium, no premium awarded.

Display of muskmelons, D. Ellivanger, 1011 Tremont Avenue, Indianapolis, Ind.....	3 00
Second premium, Whipps Bros., Marion, Ohio.....	1 00
Collection of melons, all kinds, J. S. Duckwall, 1914 Capitol Avenue N., Indianapolis, Ind.....	5 00
Second premium, D. Ellivanger, 1011 Tremont Avenue, Indianapolis, Ind	3 00
Largest and best collection of vegetables, D. Ellivanger, 1011 Tremont Avenue, Indianapolis, Ind.....	10 00
Second premium, Chas. E. Becker, Mapleton, Ind.....	5 00
Peck of peppers for pickling, D. Ellivanger, 1011 Tremont Avenue, Indianapolis, Ind	2 00
Second premium, Chas. Giesking, Mapleton, Ind.....	1 00
Display of peppers, D. Ellivanger, 1011 Tremont Avenue, Indianapolis, Ind	2 00
Second premium, Chas. E. Becker, Mapleton, Ind.....	1 00

CLASS XXXIX—Root Crops.

Twelve purple-top turnips, Whipps Bros., Marion, Ohio.....	\$2 00
Second premium, D. Ellivanger, 1011 Tremont Avenue, Indianapolis, Ind	1 00
Twelve any other variety turnips, Whipps Bros., Marion, Ohio....	2 00
Second premium, Chas. Giesking, Mapleton, Ind.....	1 00
Twelve carrots for table, Harry Bennett, Franklin, Ind.....	2 00
Second premium, Harry Bennett, Franklin, Ind.....	1 00
Twelve carrots for stock, Harry Bennett, Franklin, Ind.....	2 00
Second premium, J. D. Whitesides, Franklin, Ind.....	1 00
Twelve roots salsify, Chas. Giesking, Mapleton, Ind.....	2 00
Second premium, Chas. E. Becker, Mapleton, Ind.....	1 00
Twelve roots horseradish, Whipple Bros., Marion, Ohio.....	2 00
Second premium, Chas. Giesking, Mapleton, Ind.....	1 00
Twelve long red table beets, John Marvel, Royalton, Ind.....	2 00
Second premium, Harry Bennett, Franklin, Ind.....	1 00
Twelve turnip beets, John Marvel, Royalton, Ind.....	2 00
Second premium, Whipps Bros., Marion, Ohio.....	1 00
Twelve sugar beets, Harry Bennett, Franklin, Ind.....	2 00
Second premium, J. D. Whitesides, Franklin, Ind.....	1 00
Twelve red mangelwurtzels, Harry Bennett, Franklin, Ind.....	2 00
Second premium, John Marvel, Royalton, Ind.....	1 00
Twelve parsnips, J. D. Whitesides, Franklin, Ind.....	2 00
Second premium, Chas. E. Becker, Mapleton, Ind.....	1 00
Twelve turnip radishes, Harry Bennett, Franklin, Ind.....	2 00
Second premium, Harry Bennett, Franklin, Ind.....	1 00

Twelve winter radishes, Harry Bennett, Franklin, Ind.....	2 00
Second premium, Harry Bennett, Franklin, Ind.....	1 00
Long summer radish, Chas. E. Becker, Mapleton, Ind.....	2 00
Second premium, Becker & Becker, Mapleton, Ind.....	1 00
Peck of Prize Taker onions, Chas. E. Becker, Mapleton, Ind.....	2 00
Second premium, D. Ellivanger, 1011 Tremont Avenue, Indianapolis, Ind	1 00
Peck yellow globe onions, Whipps Bros., Marion, Ohio.....	2 00
Second premium, J. L. Keckley, Marysville, Ohio.....	1 00
Peck white globe onions, Whipps Bros., Marion, Ohio.....	2 00
Second premium, J. L. Keckley, Marysville, Ohio.....	1 00
Half peck yellow onion sets, Chas. Giesking, Mapleton, Ind.....	2 00
Second premium, Harry Bennett, Franklin, Ind.....	1 00
Half peck red onion sets, Chas. Giesking, Mapleton, Ind.....	2 00
Second premium, J. D. Whitesides, Franklin, Ind.....	1 00
Half peck white onion sets, Chas. Giesking, Mapleton, Ind.....	2 00
Second premium, Chas. E. Becker, Mapleton, Ind.....	1 00
Best display of onions, all varieties, Whipps Bros., Marion, Ohio..	3 00
Second premium, J. L. Keckley, Marysville, Ohio.....	2 00
Largest and best display root crops, all varieties, D. Ellivanger, 1011 Tremont Avenue, Indianapolis, Ind.....	5 00
Second premium, Chas. E. Becker, Mapleton, Ind.....	3 00

CLASS XL—Potatoes.

Best peck Early Rose, Harry Bennett, Franklin, Ind.....	\$2 00
Second premium, J. D. Whitesides, Franklin, Ind.....	1 00
Best peck Early Ohio, Whipps Bros., Marion, Ohio.....	2 00
Second premium, J. L. Keckley, Marysville, Ohio.....	1 00
Best peck Bliss Triumph, J. L. Keckley, Marysville, Ohio.....	2 00
Second premium, Whipps Bros., Marion, Ohio.....	1 00
Best peck Uncle Sam, J. D. Whitesides, Franklin, Ind.....	2 00
Second premium, J. L. Keckley, Marysville, Ohio.....	1 00
Best peck White Rose, Whipps Bros., Marion, Ohio.....	2 00
Second premium, J. L. Keckley, Marysville, Ohio.....	1 00
Peck World's Fair, Whipps Bros., Marion, Ohio.....	2 00
Second premium, J. L. Keckley, Marysville, Ohio.....	1 00
Peck White Elephant, Whipps Bros., Marion, Ohio.....	2 00
Second premium, J. L. Keckley, Marysville, Ohio.....	1 00
Peck Beauty of Hebron, Whipps Bros., Marion, Ohio.....	2 00
Second premium, J. D. Whitesides, Franklin, Ind.....	1 00
Peck Rural New Yorker, Whipps Bros., Marion, Ohio.....	2 00
Second premium, J. L. Keckley, Marysville, Ohio.....	1 00
Peck Queen of the West, Whipps Bros., Marion, Ohio.....	2 00
Second premium, J. L. Keckley, Marysville, Ohio.....	1 00

Peck Empire State. Whipps Bros., Marion, Ohio.....	2 00
Second premium, J. L. Keckley, Marysville, Ohio.....	1 00
Peck Green Mountain, Whipps Bros., Marion, Ohio.....	2 00
Second premium, J. L. Keckley, Marysville, Ohio.....	1 00
Peck Early Puritan, J. L. Keckley, Marysville, Ohio.....	2 00
Second premium, Whipps Bros., Marion, Ohio.....	1 00
Peck Early Harvest, Whipps Bros., Marion, Ohio.....	2 00
Second premium, J. L. Keckley, Marysville, Ohio.....	1 00
Peck Burbank Seedling, Whipps Bros., Marion, Ohio.....	2 00
Second premium, J. L. Keckley, Marysville, Ohio.....	1 00
Collection of potatoes. Whipps Bros., Marion, Ohio.....	8 00
Second premium, J. L. Keckley, Marysville, Ohio.....	4 00
Broom corn, John Marvel, Royalton, Ind.....	
Second premium, John Marvel, Royalton, Ind.....	
Sweet potatoes, red, Chas. Giesking, Mapleton, Ind.....	
Second premium, D. Ellivanger, 1011 Tremont Avenue, Indianapolis, Ind	
Potato onions, Whipps Bros., Marion, Ohio.....	
Second premium, D. Ellivanger, 1011 Tremont Avenue, Indianapolis, Ind	
Yellow Danvers, Whipps Bros., Marion, Ohio.....	
Second premium, J. L. Keckley, Marysville, Ohio.....	
Red Weathersfield, J. L. Keckley, Marysville, Ohio.....	
Yellow sweet potatoes, Chas. Giesking, Mapleton, Ind.....	
Second premium, D. Ellivanger, 1011 Tremont Avenue, Indianapolis, Ind	
Collection sweet potatoes, D. Ellivanger, 1011 Tremont Avenue, Indianapolis, Ind	
Second premium, Chas. Giesking, Mapleton, Ind.....	

DEPARTMENT J. HORTICULTURE.

CLASS XLI—Apples.

Fifteen varieties for home use, Wm. D. Thomas, Groves, Ind.....	\$10 00
Second premium, J. J. Vance, Springport, Ind.....	6 00
Ten varieties for market, Jos. A. Birton, Orleans, Ind.....	8 00
Second premium, Evan Swift, Franklin, Ind.....	5 00
Five varieties for culinary use, Wm. D. Thomas, Groves, Ind.....	4 00
Second premium, H. D. Brubaker, Ridgeway, Ind.....	2 00
Plate Maiden Blush, Evan Swift, Franklin, Ind.....	1 50
Second premium, Wm. D. Thomas, Groves, Ind.....	1 00

Plate Smith Cider, J. C. Grossman, Wolcottville, Ind.....	1 50
Second premium, Evan Swift, Franklin, Ind.....	1 00
Plate Ben Davis, Mrs. W. B. Flick, Lawrence, Ind.....	1 50
Second premium, J. Y. Damree, Bud, Ind.....	1 00
Plate Rome Beauty, Jos. A. Birton, Orleans, Ind.....	1 50
Second premium, J. Y. Damree, Bud, Ind.....	1 00
Plate wine sap, Evan Swift, Franklin, Ind.....	1 50
Second premium, H. C. Weaver, Shelbyville, Ind.....	1 00
Plate Rambo, J. C. Grossman, Wolcottville, Ind.....	1 50
Second premium, J. Y. Damree, Bud, Ind.....	1 00
Plate Yellow Bellflower, Wm. D. Thomas, Groves, Ind.....	1 50
Second premium, L. M. Gregg, Dayton, Ohio.....	1 00
Plate Fallawater, J. C. Grossman, Wolcottville, Ind.....	1 50
Second premium, C. P. Bradley, South Bend, Ind.....	1 50
Plate Fall Pippin, C. P. Bradley, South Bend, Ind.....	1 50
Second premium, J. C. Grossman, Wolcottville, Ind.....	1 00
Plate Willow Twig, Jos. A. Birton, Orleans, Ind.....	1 50
Second premium, Mrs. W. B. Flick, Lawrence, Ind.....	1 00
Plate Westfield, C. P. Bradley, South Bend, Ind.....	1 50
Second premium, Wm. D. Thomas, Groves, Ind.....	1 00
Plate Wagner, J. C. Grossman, Wolcottville, Ind.....	1 50
Second premium, J. C. Grossman, Wolcottville, Ind.....	1 00
Plate Gravenstein, J. C. Grossman, Wolcottville, Ind.....	1 50
Second premium, no premium awarded.	
Plate Fameuse or Snow, L. M. Gregg, Dayton, Ohio.....	1 50
Second premium, W. H. Vance, Springport, Ind.....	1 00
Plate Moore Sweet, Fred Dickson, Lawrence, Ind.....	1 50
Second premium, Roy Hindman, Lawrence, Ind.....	1 00
Plate Tompkins King, J. C. Grossman, Wolcottville, Ind.....	1 50
Second premium, J. C. Grossman, Wolcottville, Ind.....	1 00
Plate Hubbardson, C. P. Bradley, South Bend, Ind.....	1 50
Second premium, J. Y. Damree, Bud, Ind.....	1 00
Plate Red Canada, L. M. Gregg, Dayton, Ohio.....	1 50
Second premium, J. Y. Damree, Bud, Ind.....	1 00
Plate Rhode Island Greening, J. C. Grossman, Wolcottville, Ind...	1 50
Second premium, Wm. D. Thomas, Groves, Ind.....	1 00
Plate Clayton, Fred Dickson, Lawrence, Ind.....	1 50
Second premium, Mrs. W. B. Flick, Lawrence, Ind.....	1 00
Plate White Pippin, Wm. D. Thomas, Groves, Ind.....	1 50
Second premium, Mrs. W. B. Flick, Lawrence, Ind.....	1 00
Plate Baldwin, J. C. Grossman, Wolcottville, Ind.....	1 50
Second premium, J. J. Vance, Springport, Ind.....	1 00
Plate York Imperial, J. Y. Damree, Bud, Ind.....	1 50
Second premium, John Tilson, Franklin, Ind.....	1 00
Plate Northern Spy, Whipps Bros., Marion, Ohio.....	1 50

Second premium, Wm. D. Thomas, Groves, Ind.....	1 00
Plate Grimes's Golden, Jos. A. Birton, Orleans, Ind.....	1 50
Second premium, J. Y. Damree, Bud, Ind.....	1 00
Plate Roman Stem, C. P. Bradley, South Bend, Ind.....	1 50
Second premium, W. H. Vance, Springport, Ind.....	1 00
Plate Indiana Favorite, Wm. D. Thomas, Groves, Ind.....	1 50
Second premium, J. J. Vance, Springport, Ind.....	1 00
Plate Belmont, L. M. Gregg, Dayton, Ohio.....	1 50
Second premium, no premium awarded.	
Plate Jonathan, Evan Swift, Franklin, Ind.....	1 50
Second premium, Wm. D. Thomas, Groves, Ind.....	1 00
Plate Lansingburg, Evan Swift, Franklin, Ind.....	1 50
Second premium, J. J. Vance, Springport, Ind.....	1 00
Plate Talman Sweet, L. M. Gregg, Dayton, Ohio.....	1 50
Second premium, J. C. Grossman, Wolcottville, Ind.....	1 00
Plate Vandevere, Wm. D. Thomas, Groves, Ind.....	1 50
Second premium, J. Y. Damree, Bud, Ind.....	1 00
Plate Twenty-Ounce, J. C. Grossman, Wolcottville, Ind.....	1 50
Second premium, L. M. Gregg, Dayton, Ohio.....	1 00
Plate Rall's Genet, Jos. A. Birton, Orleans, Ind.....	1 50
Second premium, Mrs. W. B. Flick, Lawrence, Ind.....	1 00
Plate Wealthy, J. C. Grossman, Wolcottville, Ind.....	1 50
Second premium, John Marvel, Royalton, Ind.....	1 00
Plate Stark, W. H. Vance, Springport, Ind.....	1 50
Second premium, Wm. D. Thomas, Groves, Ind.....	1 00
Plate Pewaukee, J. Y. Damree, Bud, Ind.....	1 50
Second premium, W. D. Thomas, Groves, Ind.....	1 00
Plate English Russett, J. C. Grossman, Wolcottville, Ind.....	1 50
Second premium, Wm. D. Thomas, Groves, Ind.....	1 00

CRAB APPLES.

Plate Hyslop, J. Y. Damree, Bud, Ind.....	1 50
Second premium, J. C. Grossman, Wolcottville, Ind.....	1 00
Plate red Siberian, no premiums awarded.	
Plate Transcendent, John Marvel, Royalton, Ind.....	1 50
Second premium, Mrs. W. B. Flick, Lawrence, Ind.....	1 00
Plate Whitney, C. P. Bradley, South Bend, Ind.....	1 50
Second premium, no premium awarded.	
Eight varieties for family use, Mrs. W. B. Flick, Lawrence, Ind...	8 00
Second premium, no premium awarded.	
Six varieties for market, Mrs. W. B. Flick, Lawrence, Ind.....	5 00
Second premium, no premium awarded.	

PEARS.

Plate Bartlett, Wm. D. Thomas, Groves, Ind.....	1 50
Second premium, Evan Swift, Franklin, Ind.....	1 00
Plate Clapp Favorite, L. M. Gregg, Dayton, Ohio.....	1 50
Second premium, Wm. D. Thomas, Groves, Ind.....	1 00
Plate Anjou, C. P. Bradley, South Bend, Ind.....	1 50
Second premium, Roy Hindman, Lawrence, Ind.....	1 00
Plate Angouleme, Whipps Bros., Marion, Ohio.....	1 50
Second premium, L. M. Gregg, Dayton, Ohio.....	1 00
Plate Flemish Beauty, Roy Hindman, Lawrence, Ind.....	1 50
Second premium, Fred Dickson, Lawrence, Ind.....	1 00
Plate Howell, L. M. Gregg, Dayton, Ohio.....	1 50
Second premium, C. P. Bradley, South Bend, Ind.....	1 00
Plate Keiffer, Whipps Bros., Marion, Ohio.....	1 50
Second premium, Whipps Bros., Marion, Ohio.....	1 00
Plate Louis Bon, C. P. Bradley, South Bend, Ind.....	1 50
Second premium, J. A. Heavenridge, Muncie, Ind.....	1 00
Plate Sheldon, Wm. D. Thomas, Groves, Ind.....	1 50
Second premium, John Marvel, Royalton, Ind.....	1 00
Plate Seckel, Wm. D. Thomas, Groves, Ind.....	1 50
Second premium, J. C. Grossman, Wolcottville, Ind.....	1 00
Plate Easter Beurre, J. A. Heavenridge, Muncie, Ind.....	1 50
Second premium, no premium awarded.	
Plate Lawrence, J. A. Heavenridge, Muncie, Ind.....	1 50
Second premium, no premium awarded.	
Plate Winter Nelis, Evan Swift, Franklin, Ind.....	1 50
Second premium, Wm. D. Thomas, Groves, Ind.....	1 00
Plate Vickar, J. C. Grossman, Wolcottville, Ind.....	1 50
Second premium, L. M. Gregg, Dayton, Ohio.....	1 00

PEACHES.

Six varieties for any purpose, John Marvel, Royalton, Ind.....	\$6 00
Second premium, J. J. Vance, Springport, Ind.....	3 00
Three varieties for market, no premiums awarded.	
Plate clings, Roy Hindman, Lawrence, Ind.....	1 50
Second premium, John Marvel, Royalton, Ind.....	1 50

QUINCES.

Collection of not less than three varieties, C. P. Bradley, South Bend, Ind	3 00
Second premium, Mrs. W. B. Flick, Lawrence, Ind.....	1 50
Plate Orange, C. P. Bradley, South Bend, Ind.....	1 50
Second premium, J. C. Grossman, Wolcottville, Ind.....	1 00

Plate Meeche's Prolific, Mrs. W. B. Flick, Lawrence, Ind.....	1 50
Second premium, C. P. Bradley, South Bend, Ind.....	1 00
Plate Champion, J. C. Grossman, Wolcottville, Ind.....	1 50
Second premium, C. P. Bradley, South Bend, Ind.....	1 00
Plate Missouri Mammoth, Mrs. W. B. Flick, Lawrence, Ind.....	1 50
Second premium, no premium awarded.	

PLUMS.

Collection of native plums, J. W. Daubenspeck, Mattsville, Ind....	2 00
Second premium, J. J. Vance, Springport, Ind.....	1 00
Collection European, C. P. Bradley, South Bend, Ind.....	2 00
Second premium, John Marvel, Royalton, Ind.....	1 00
Collection Japanese, no premiums awarded.	
Plate native plums, John Marvel Royalton, Ind.....	1 50
Second premium, J. C. Grossman, Wolcottville, Ind.....	1 00
Plate European, C. P. Bradley, South Bend, Ind.....	1 50
Second premium, John Marvel, Royalton, Ind.....	1 00
Plate Japanese, John Marvel, Royalton, Ind.....	1 50
Second premium, Sylvester Johnson, 62 South Central Avenue, Irvington, Ind	1 00

GRAPES.

Ten varieties for family use, C. P. Bradley, South Bend, Ind.....	\$5 00
Second premium, C. A. Saltmarsh, Seymour, Ind.....	2 00
Ten varieties for market, C. P. Bradley, South Bend, Ind.....	3 00
Second premium, C. P. Bradley, South Bend, Ind.....	1 50
Five clusters, any kind, C. P. Bradley, South Bend, Ind.....	2 00
Second premium, C. P. Bradley, South Bend, Ind.....	1 00
Plate Worden, C. P. Bradley, South Bend, Ind.....	1 50
Second premium, C. P. Bradley, South Bend, Ind.....	1 00
Plate Concord, C. P. Bradley, South Bend, Ind.....	1 50
Second premium, C. P. Bradley, South Bend, Ind.....	1 00
Plate Wilder, C. P. Bradley, South Bend, Ind.....	1 50
Second premium, Sylvester Johnson, 62 South Central Avenue, Irvington, Ind	1 00
Plate Duchess, C. P. Bradley, South Bend, Ind.....	1 50
Second premium, Sylvester Johnson, 62 South Central Avenue, Ir- vington, Ind	1 00
Plate Brighton, C. P. Bradley, South Bend, Ind.....	1 50
Second premium, C. P. Bradley, South Bend, Ind.....	1 00
Plate Salem, Sylvester Johnson, 62 South Central Avenue, Irving- ton, Ind	1 50
Second premium, no premium awarded.	
Plate Lindley, C. P. Bradley, South Bend, Ind.....	1 50

ANNUAL MEETING.

131

Second premium, C. P. Bradley, South Bend, Ind.....	1 00
Plate Pocklington, C. P. Bradley, South Bend, Ind.....	1 50
Second premium, C. P. Bradley, South Bend, Ind.....	1 00
Plate Niagara, C. P. Bradley, South Bend, Ind.....	1 50
Second premium, C. P. Bradley, South Bend, Ind.....	1 00
Plate Diamond, Sylvester Johnson, 62 South Central Avenue, Irving- ton, Ind	1 50
Second premium, C. P. Bradley, South Bend, Ind.....	1 00
Plate Vergennes, no premiums awarded.	
Plate McPike, Sylvester Johnson, 62 South Central Avenue, Irving- ton, Ind	1 50
Second premium, no premium awarded.	
Plate Campbell, Sylvester Johnson, 62 South Central Avenue, Ir- vington, Ind	1 50
Second premium, no premium awarded.	
Plate hothouse grapes, Sylvester Johnson, 62 South Central Ave- nue, Irvington, Ind.....	1 50
Second premium, no premium awarded.	
Plate seedlings, not named, Sylvester Johnson, 62 South Central Avenue, Irvington, Ind.....	1 50
Second premium, G. A. Stanton, Southport, Ind.....	1 00
Plate persimmons, John Tilson, Franklin, Ind.....	1 00
Plate pawpaws, John Marvel, Royalton, Ind.....	1 00
Second premium, Evan Swift, Franklin, Ind.....	50
Display of fruits by Indiana society, J. C. Grossman, Wolcottville, Ind	50 00
Second premium, H. C. Weaver, Shelbyville, Ind.....	30 00
Third premium, Marion County Agricultural and Horticultural So- ciety, by I. N. Cotton, Broad Ripple, Ind.....	20 00
Display fruits and grasses arranged and collected by boy or girl under eighteen years of age residing in Indiana, Fred Dick- son, Lawrence, Ind.....	16 00
Second premium, F. M. Sandford, Philadelphia, Ind.....	12 00
Third premium, Roy Hindman, Lawrence, Ind.....	8 00

FLOWERS.

CLASS XLII—Plants.

Ten palms, A. Wiegand & Son, Indianapolis, Ind.....	\$10 00
Second premium, no premium awarded.	
Twenty ferns and lycopodiums, no first premium awarded.	
Second premium, A. Wiegand & Son, Indianapolis, Ind.....	10 00
Ten crotons, no first premium awarded.	
Second premium, A. Wiegand & Son, Indianapolis, Ind.....	4 00

Twenty variegated show plants, A. Wiegand & Son, Indianapolis, Ind	10 00
Second premium, no premium awarded.	
Ten cannas, no premiums awarded.	
Ten blooming begonias, no premiums awarded.	
Ten foliage begonias, no premiums awarded.	
Six geraniums in bloom, no premiums awarded.	
Two vases filled, A. Wiegand & Son, Indianapolis, Ind.....	8 00
Second premium, no premium awarded.	

SPECIAL.

Display and arrangement show, A. Wiegand & Son, Indianapolis, Ind	25 00
Second premium, no premium awarded.	
Two floral arrangements, John Rieman, Indianapolis, Ind.....	25 00
Second premium, Huntington & Page, Indianapolis, Ind.....	15 00
Two baskets, John Rieman, Indianapolis, Ind.....	15 00
Second premium, no premium awarded.	
Three bouquets, John Rieman, Indianapolis, Ind.....	10 00
Second premium, no premium awarded.	
Collection cut roses, W. W. Coles, Kokomo, Ind.....	10 00
Second premium, no premium awarded.	
Collection cut flowers, W. W. Coles, Kokomo, Ind.....	15 00
Second premium, no premium awarded.	
Collection dahlias, W. W. Coles, Kokomo, Ind.....	5 00
Second premium, no premium awarded.	
Collection of cut gladioli, W. W. Coles, Kokomo, Ind.....	15 00
Second premium, no premium awarded.	
Original show of flowers, John Rieman, Indianapolis, Ind.....	50 00
Second premium, Huntington & Page, Indianapolis, Ind.....	35 00
Wedding or reception arrangement of flowers, John Rieman, Indianapolis, Ind	25 00
Second premium, no premium awarded.	

CLASS XLIII—Amateur.

Collection of begonias, Mrs. Cora Banons Edwards, 3236 North Illinois Street, Indianapolis, Ind.....	\$5 00
Second premium, Mrs. Frank P. Johnson, Howlands, Ind.....	3 00
Collection of asters in bloom, no premiums awarded.	
Collection climbing and trailing plants, no first premium awarded.	
Second premium, Mrs. W. B. Flick, Lawrence, Ind.....	2 00
Three hanging baskets, Mrs. W. B. Flick, Lawrence, Ind.....	3 00
Second premium, Mrs. J. C. Deathe, 712 East Georgia Street, Indianapolis, Ind	2 00

Collection geraniums, Mrs. P. D. Stagg, Greensburg, Ind.....	3 00
Second premium, Mrs. W. B. Flick, Lawrence, Ind.....	2 00
Collection roses, Jessie Tyer, 1013 Elm Street, Indianapolis, Ind...	4 00
Second premium, no premium awarded.	
Collection verbenas, Mrs. P. D. Stagg, Greensburg, Ind.....	3 00
Second premium, no premium awarded.	
Collection dahlias, Mrs. J. C. Deathe, 712 Georgia Street, Indianapolis, Ind	3 00
Second premium, Mrs. P. D. Stagg, Greensburg, Ind.....	2 00
Collection gladiolus, Mrs. W. B. Flick, Lawrence, Ind.....	3 00
Second premium, no premium awarded.	
Design of cut flowers, Jessie Tyer, 1013 Elm Street, Indianapolis, Ind	8 00
Second premium, Mrs. W. B. Flick, Lawrence, Ind.....	4 00
Twelve carnations, Jessie Tyer, 1013 Elm Street, Indianapolis, Ind	3 00
Second premium, Mrs. W. B. Flick, Lawrence, Ind.....	2 00
Two bouquets, Jessie Tyer, 1013 Elm Street, Indianapolis, Ind....	4 00
Second premium, Mrs. W. B. Flick, Lawrence, Ind.....	2 00

DEPARTMENT K. BEES AND HONEY.

CLASS XLIV.

Comb honey, George M. Rumler, Mohawk, Ind.....	\$13 00
Second premium, Walter S. Pouder, Indianapolis, Ind.....	6 00
Extracted honey, George M. Rumler, Mohawk, Ind.....	13 00
Second premium, Walter S. Pouder, Indianapolis, Ind.....	6 00
Beeswax, Walter S. Pouder, Indianapolis, Ind.....	7 00
Second premium, George M. Rumler, Mohawk, Ind.....	3 00
Italian bees, Walter S. Pouder, Indianapolis, Ind.....	5 00
Second premium, George M. Rumler, Mohawk, Ind.....	3 00
Italian queen bee, Walter S. Pouder, Indianapolis, Ind.....	5 00
Second premium, George M. Rumler, Mohawk, Ind.....	3 00
Honey vinegar, A. F. Ward, Thorntown, Ind.....	2 00
Second premium, M. B. Walters, Greenwood, Ind.....	1 00
Apiarian supplies, Walter S. Pouder, Indianapolis, Ind.....	15 00
Second premium, George M. Rumler, Mohawk, Ind.....	8 00
Foundation for brood chamber, Walter S. Pouder, Indianapolis, Ind	2 00

Second premium, George M. Rumler, Mohawk, Ind.....	1 00
Foundation for surplus honey, Walter S. Pouder, Indianapolis, Ind	2 00
Second premium, George M. Rumler, Mohawk, Ind.....	1 00
Honey extractor, Walter S. Pouder, Indianapolis, Ind.....	3 00
Second premium, George M. Rumler, Mohawk, Ind.....	2 00
Wax extractor, Walter S. Pouder, Indianapolis, Ind.....	3 00
Second premium, no premium awarded.	
Beehive for comb honey, Walter S. Pouder, Indianapolis, Ind.....	3 00
Second premium, George M. Rumler, Mohawk, Ind.....	2 00
Beehive for extracted honey, Walter S. Pouder, Indianapolis Ind..	3 00
Second premium, George M. Rumler, Mohawk, Ind.....	2 00
Shipping crate for comb honey, George M. Rumler, Mohawk, Ind..	2 00
Second premium, Walter S. Pouder, Indianapolis, Ind.....	1 00
Uncapping knife, Walter S. Pouder, Indianapolis, Ind.....	1 00
Second premium, George M. Rumler, Mohawk, Ind.....	50
Smoker, Walter S. Pouder, Indianapolis, Ind.....	1 00
Second premium, George M. Rumler, Mohawk, Ind.....	50

DEPARTMENT L. ART.

CLASS XLV—Knitting and Crochet Work.

(D. G. Cherry, Judge, Newark, Ohio.)

Infant's shirt, Mrs. V. L. Wilson, Connersville, Ind.....	\$1 50
Second premium, Mrs. Hilda Field, Greensburg, Ind.....	75
Infant's sock display, Mrs. M. A. Paynes, Palmyra, Mo.....	1 50
Second premium, Mrs. P. D. Stagg, Greensburg, Ind.....	75
Silk mittens, Anna Miller, Quincy, Ill.....	1 50
Second premium, Mrs. V. L. Wilson, Connersville, Ind.....	75
Silk stockings, Mrs. C. C. Burns, Greensburg, Ind.....	1 50
Second premium, Mrs. M. A. Paynes, Palmyra, Mo.....	75
Pair woolen stockings, Mrs. P. D. Stagg, Greensburg, Ind.....	1 50
Second premium, Mrs. George Sands, Kokomo, Ind.....	75
Infant's crochet sacque, Mrs. M. A. Paynes, Palmyra, Mo.....	1 50
Second premium, Mrs. Rosa Busick, Kokomo, Ind.....	75
Couch cover, Anna Miller, Quincy, Ill.....	2 00
Second premium, Mrs. Allen Sammons, Indianapolis, Ind.....	1 00
Crochet skirt, Anna Miller, Quincy, Ill.....	2 00
Second premium, E. A. McLeod, Cincinnati, Ohio.....	1 00

Child's crochet skirt, Anna Miller, Quincy, Ill.....	1 50
Silk purse, Mrs. C. Dille, Greensburg, Ind.....	1 00
Second premium, Mrs. William E. B. Smith, Denver, Col.....	50
Crochet spread, M. A. Brown, Indianapolis, Ind.....	2 00
Second premium, Mrs. Will Landis, Indianapolis, Ind.....	1 00
Infant's silk cap, Mrs. M. A. Paynes, Palmyra, Mo.....	1 50
Second premium, Mrs. C. Dille, Greensburg, Ind.....	75

CLASS XLVI—Lace Work.

(D. G. Cherry, Judge, Newark, Ohio.)

Battenburg specimen, Mary J. Lynch, Kokomo, Ind.....	\$1 50
Second premium, L. I. Bahr, Huntington, Ind.....	1 00
Battenburg dresser scarf, Mrs. C. C. Burns, Greensburg, Ind.....	1 50
Second premium, Mrs. John King, Indianapolis, Ind.....	1 00
Battenburg table cover, Mary J. Lynch, Kokomo, Ind.....	1 50
Second premium, L. I. Bahr, Huntington, Ind.....	1 00
Battenburg center piece, Miss Flora Greenstreet, Indianapolis, Ind	1 50
Second premium, Mary J. Lynch, Kokomo, Ind.....	1 00
Battenburg tidy, Mary J. Lynch, Kokomo, Ind.....	1 50
Second premium, Msr. L. A. Moore, Terre Haute, Ind.....	1 00
Battenburg sideboard scarf, Mary J. Lynch, Kokomo, Ind.....	1 50
Second premium, Mrs. C. C. Burns, Greensburg, Ind.....	1 00
Battenburg display, L. I. Bahr, Huntington, Ind.....	2 00
Second premium, Mrs. L. A. Moore, Terre Haute, Ind.....	1 00
Point lace display, Mrs. M. A. Paynes, Palmyra, Mo.....	3 00
Second premium, Mrs. A. G. Jackson, Bennington, Ind.....	1 50
Point lace specimen, Mrs. M. A. Paynes, Palmyra, Mo.....	2 00
Second premium, Mrs. A. G. Jackson, Bennington, Ind.....	1 00
Point lace handkerchief, Miss Flora Greenstreet, Indianapolis, Ind	2 00
Second premium, Mrs. C. C. Burns, Greensburg, Ind.....	1 00
Bed set, Mrs. John F. Holtzman, Indianapolis, Ind.....	3 00
Second premium, Miss Laura Heck, 807 East Eleventh Street, Indi- anapolis, Ind	2 00

CLASS XLVII—Embroidery, Hand-Made.

(D. G. Cherry, Judge, Newark, Ohio.)

Delft, Mrs. R. H. Talbott, Lexington, Ky.....	\$2 00
Second premium, Mrs. L. A. Moore, Terre Haute, Ind.....	1 00
Jewel, Mrs. L. A. Moore, Terre Haute, Ind.....	2 00
Second premium, Mrs. R. H. Talbott, Lexington, Ky.....	1 00
Castlestitch, second premium, Mrs. Allen Sammons, Indianapolis, Ind	1 00

Egyptian, Mrs. A. G. Jackson, Bennington, Ind.....	2 00
Second premium, Mrs. C. C. Burns, Greensburg, Ind.....	1 00
Cut glass, second premium, Mrs. C. C. Burns, Greensburg, Ind.....	1 00
Honiton, Mrs. L. A. Moore, Terre Haute, Ind.....	2 00
Second premium, Mrs. Mattie Brewer, Indianapolis, Ind.....	1 00
Cotton, Mrs. C. Dille, Greensburg, Ind.....	2 00
Second premium, Mrs. P. D. Stagg, Greensburg, Ind.....	1 00
Kensington, Mrs. R. H. Talbott, Lexington, Ky.....	2 00
Second premium, Mrs. William E. B. Smith, Denver, Col.....	1 00
Rope silk, Mrs. L. A. Moore, Terre Haute, Ind.....	2 00
Second premium, Mrs. E. Buck, Lockland, Ohio.....	1 00
Roman, Mrs. M. A. Paynes, Palmyra, Mo.....	2 00
Second premium, Mrs. C. C. Burns, Greensburg, Ind.....	1 00
Sorrento, Mrs. C. Dille, Greensburg, Ind.....	2 00
Second premium, Mrs. Hilda Field, Greensburg, Ind.....	1 00
Outline, Mrs. R. H. Talbott, Lexington, Ky.....	1 50
Second premium, Mary J. Lynch, Kokomo, Ind.....	75
Embroidery on bolting cloth, Mrs. J. J. Garver, Indianapolis, Ind..	2 00
Second premium, Mrs. E. Buck, Lockland, Ohio.....	1 00
Embroidery on chamois, Mrs. J. J. Garber, Indianapolis, Ind.....	2 00
Second premium, Mrs. P. D. Stagg, Greensburg, Ind.....	1 00
Queen Ann darning, Mrs. M. A. Paynes, Palmyra, Mo.....	2 00
Second premium, Mrs. George Sands, Kokomo, Ind.....	1 00
Denim specimen, L. I. Bahr, Huntington, Ind.....	1 50
Second premium, Mrs. George Sands, Kokomo, Ind.....	75
Basket or molle cloth, Anna Miller, Quincy, Ill.....	1 50
Second premium, Mrs. C. Dille, Greensburg, Ind.....	75
High art needle work, Mrs. L. A. Moore, Terre Haute, Ind.....	2 00
Second premium, L. I. Bahr, Huntington, Ind.....	1 00
Tinting and embroidery, Mrs. P. D. Stagg, Greensburg, Ind.....	1 50
Second premium, Miss Mattie Atkins, Cincinnati, Ohio.....	75
Lunch set, Anna Miller, Quincy, Ill.....	3 00
Second premium, Mrs. C. Dille, Greensburg, Ind.....	2 00
Doiley set, Mrs. J. J. Garver, Indianapolis, Ind.....	2 00
Second premium, Mrs. R. H. Talbott, Lexington, Ky.....	1 00
Linen tablecloth and six napkins, Mrs. C. Dille, Greensburg, Ind..	3 00
Second premium, Mrs. Hilda Field, Greensburg, Ind.....	2 00
Hostess cloth, L. I. Bahr, Huntington, Ind.....	2 00
Second premium, Miss Mattie Atkins, Cincinnati, Ohio.....	1 00
Tray cloth, Mrs. R. H. Talbott, Lexington, Ky.....	1 50
Second premium, L. I. Bahr, Huntington, Ind.....	75
Handkerchief, Mrs. P. D. Stagg, Greensburg, Ind.....	1 50
Second premium, Mrs. C. Dille, Greensburg, Ind.....	75
Skirt, silk embroidery, Mrs. L. A. Moore, Terre Haute, Ind.....	2 00
Second premium, Mrs. C. Dille, Greensburg, Ind.....	1 00

Infant's shawl, Mrs. J. Liebhardt, Knightstown, Ind.....	2 00
Second premium, Anna Miller, Quincy, Ill.....	1 00
Infant's cap, Mrs. C. Dille, Greensburg, Ind.....	1 50
Second premium, Anna Miller, Quincy, Ill.....	75
Table scarf, second premium, Mrs. George Sands, Kokomo, Ind....	1 00
Sideboard scarf, Mrs. C. C. Burns, Greensburg, Ind.....	2 00
Second premium, Mrs. Wm. E. B. Smith, Denver, Col.....	1 00
Piano scarf, second premium, Mrs. George Sands, Kokomo, Ind....	1 00
Dresser furnishings, Mrs. C. C. Burns, Greensburg, Ind.....	1 50
Second premium, Mrs. William E. B. Smith, Denver, Col.....	75
Couch pillow, Mrs. George Sands, Kokomo, Ind.....	2 00
Second premium, Mrs. J. Liebhardt, Knightstown, Ind.....	1 00
Toilet cushion, Mrs. William E. B. Smith, Denver, Col.....	1 50
Second premium, Mrs. Allen Summons, Indianapolis, Ind.....	75
Table cover, Mrs. J. Liebhardt, Knightstown, Ind.....	2 00
Second premium, Mrs. C. C. Burns, Greensburg, Ind.....	1 00
Table center, Mrs. R. H. Talbott, Lexington, Ky.....	2 00
Second premium, B. I. Bahr, Huntington, Ind.....	1 00
Pair towels, linen embroidery, Mrs. C. Dille, Greensburg, Ind....	2 00
Second premium, Mrs. William E. B. Smith, Denver, Col.....	1 00
Handkerchief satchel, L. I. Bahr, Huntington, Ind.....	1 50
Second premium, Mary J. Lynch, Kokomo, Ind.....	75
Glove satchel, Mrs. L. A. Moore, Terre Haute, Ind.....	1 50
Second premium, L. I. Bahr, Huntington, Ind.....	75
Tea cosey, second premium, Mrs. P. D. Stagg, Greensburg, Ind....	75
Picture frame, Mrs. J. J. Garver, Indianapolis, Ind.....	1 50
Second premium, Anna Miller, Quincy, Ill.....	75
Bulgarian work, Mrs. C. C. Burns, Greensburg, Ind.....	1 50
Second premium, Miss Margaret Bryan, Indianapolis, Ind.....	75

CLASS XLVIII—Sewing.

(D. G. Cherry, Judge, Newark, Ohio.)

MACHINE WORK.

Display ladies' underwear, Anna Miller, Quincy, Ill.....	\$3 00
Second premium, Mrs. C. Dille, Greensburg, Ind.....	1 50
Hemstitching, Mrs. George Sands, Kokomo, Ind.....	1 50
High art machine work, second premium, Mrs. C. Dille, Greensburg, Ind.....	1 00
Handkerchief, Mrs. E. Buck, Lockland, Ohio.....	1 50
Second premium, Mrs. George Sands, Kokomo, Ind.....	75
Ladies' tea jacket, Mrs. George Sands, Kokomo, Ind.....	1 50
Second premium, Mrs. Allen Sammons, Indianapolis, Ind.....	75

HAND WORK

Hemstitching, specimen, Mrs. Chas. Railsback, Indianapolis, Ind..	2 00
Second premium, Mrs. P. D. Stagg, Greensburg, Ind.....	1 00
Hemstitching, silk, Mary Faught, Indianapolis, Ind.....	2 00
Second premium, Mrs. L. A. Moore, Terre Haute, Ind.....	1 00
Hemstitching linen, Mrs. L. A. Moore, Terre Haute, Ind.....	2 00
Second premium, Mary J. Lynch, Kokomo, Ind.....	1 00
Drawn work, Mrs. C. C. Burns, Greensburg, Ind.....	1 50
Second premium, Mrs. George Sands, Kokomo, Ind.....	75
Drawn work, Persian, L. I. Bahr, Huntington, Ind.....	2 00
Second premium, Mrs. L. A. Moore, Terre Haute, Ind.....	1 00
Infant's outfit, Mrs. C. Dille, Greensburg, Ind.....	4 00
Second premium, Mrs. C. C. Burns, Greensburg, Ind.....	2 00
Ladies' white skirt, Mary J. Lynch, Kokomo, Ind.....	2 00
Second premium, Mrs. Wm. E. B. Smith, Denver, Col.....	1 00

CLASS XLIX—Ladies' Fancy Work.

(D. G. Cherry, Judge, Newark, Ohio.)

Toilet cushion, Louise T. Pfafflin, Indianapolis, Ind.....	1 50
Second premium, Mrs. L. A. Moore, Indianapolis, Ind.....	75
Couch pillow, L. I. Bahr, Huntington, Ind.....	1 50
Second premium, Mrs. Maude Everett Indianapolis Ind.....	75
Nursery basket, Mrs. C. Dille, Greensburg, Ind.....	2 00
Second premium, Mrs. Rosa Busick, Kokomo, Ind.....	1 00
Infant's afghan, Anna Miller, Quincy, Ill.....	1 50
Second premium, Mrs. J. Liebhardt, Knightstown, Ind.....	75
Book cover, Mrs. Allen Sammons, Indianapolis, Ind.....	1 50
Second premium, Mrs. P. D. Stagg, Greensburg, Ind.....	75
Lunch set, Anna Miller, Quincy, Ill.....	2 00
Second premium, Mrs. B. Booth, Indianapolis, Ind.....	1 00
Doilies, Mrs. L. A. Moore, Terre Haute, Ind.....	1 50
Second premium, Mrs. A. G. Jackson, Bennington, Ind.....	75
Head rest, Mrs. C. Dille, Greensburg, Ind.....	1 50
Second premium, Mrs. Harriett Van Horn, Indianapolis Ind.....	75
Reticule, Anna Miller, Quincy, Ill.....	1 50
Second premium, Mrs. L. A. Moore, Terre Haute, Ind.....	75
Fancy apron, Mrs. Allen Sammons, Indianapolis, Ind.....	1 50
Second premium, Anna Miller, Quincy, Ill.....	75
Kitchen apron, Mrs. George Sands, Kokomo, Ind.....	1 50
Second premium, Mary J. Lynch, Kokomo, Ind.....	75
Housewife, Miss Laura Heck, Indianapolis, Ind.....	1 50
Second premium, Miss Mattie Atkins, Cincinnati, Ohio.....	75
Table cover, Mrs. E. Buck, Lockland, Ohio.....	1 50

Second premium. Mrs. George Sands, Kokomo, Ind.....	75
Table center. Mrs. R. H. Talbott, Lexington, Ky.....	1 50
Second premium. Mary J. Lynch, Kokomo, Ind.....	75
Opera bag. Mrs. William Welsh, Indianapolis, Ind.....	1 50
Second premium, Mrs. Wm. E. B. Smith, Denver, Col.....	75
Laundry bag. L. I. Bahr, Huntington, Ind.....	1 50
Second premium, Mrs. J. Liebhardt, Knightstown, Ind.....	75
Silk quilt, T. O. Barnes, Indianapolis, Ind.....	2 00
Second premium, Kate Griffin, Indianapolis, Ind.....	1 00
Crazy quilt. Mrs. Alice Hartpence, Indianapolis, Ind.....	2 00
Second premium, Mrs. P. L. Bennett, Indianapolis, Ind.....	1 00

CLASS I.—Photography.

(Mrs. Horace Fletcher and Mrs. Thomas H. Spann, Judges. Indianapolis, Ind.)

PROFESSIONAL.

Best specimen photography, Nicholson & Son, Crawfordsville, Ind.	\$4 00
Second premium, J. O. Cammack, Greencastle, Ind.....	2 00
Best display photography, six pieces, Nicholson & Son, Crawfordsville, Ind.....	10 00

AMATEUR.

Best display pictures, 3½x3½ or under, plate or film camera. C. I. Fletcher, Indianapolis, Ind.....	Medal.
Second premium, M. H. Pritchard, Indianapolis, Ind.....	Medal.
Best display pictures, 3½x4½, plate camera. A. O. Mason, Indianapolis, Ind.....	Medal.
Second premium, A. W. Bitting, Lafayette, Ind.....	Medal.
Best display pictures, 4x5, plate or film camera, H. C. Pomeroy, Indianapolis, Ind.....	Medal.
Second premium, C. I. Fletcher, Indianapolis, Ind.....	Medal.
Best display pictures, 5x7, plate or film camera. John Wocher, Indianapolis, Ind.....	Medal.
Second premium, O. L. Foster, Lafayette, Ind.....	Medal.
Best display pictures, 6½x8½, plate or film camera. Frank Murphy, Indianapolis, Ind.....	Medal.
Second premium, Flaws Duden, Indianapolis, Ind.....	Medal.

CLASS LI—Decorative Art Work.

(D. G. Cherry, Judge, Newark, Ohio.)

Hammered or repousse work. Mrs. E. P. Thayer, Greenfield, Ind....	\$2 00
Second premium, Mrs. Willis Fugate, Indianapolis, Ind.....	1 00

Modeling in clay, Miss Minnie B. Akass, Chicago, Ill.....	10 00
Second premium, Mrs. H. W. Barnitz, Urbana, Ohio.....	5 00
Carved or incision work on raw clay, Miss Minnie B. Akass, Chicago, Ill.....	3 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	2 00
Bas relief, Miss Minnie B. Akass, Chicago, Ill.....	4 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	2 00
Wood carving display, Mrs. B. Booth, Indianapolis, Ind.....	8 00
Second premium, Lena L. Ingraham, Indianapolis, Ind.....	4 00
Wood carving, specimen, Mrs. B. Booth, Indianapolis, Ind.....	4 00
Second premium, Mrs. William Welch, Indianapolis, Ind.....	2 00
Tapestry painting, Mrs. W. S. Day, Indianapolis, Ind.....	5 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	3 00
Painted menu cards original designs, display, May Greenleaf, Indianapolis, Ind.....	3 00
Second premium, Mrs. Marie Folger, Indianapolis, Ind.....	2 00
Blotting pad, Grace Greenleaf, Indianapolis, Ind.....	2 00
Second premium, Mrs. Clinton Hall, Indianapolis, Ind.....	1 00
Calendar, Mrs. William Welch, Indianapolis, Ind.....	2 00
Second premium, Miss Cornelia Warner, Crawfordsville, Ind.....	1 00
Letter case, May Greenleaf, Indianapolis, Ind.....	2 00
Second premium, Carrie F. Mosteller, Newark, Ohio.....	1 00
Visiting list, Grace Greenleaf, Indianapolis, Ind.....	2 00
Second premium, Carrie F. Mosteller, Newark, Ohio.....	1 00
Best collection of new and useful articles, decorated, Carrie F. Mosteller, Newark, Ohio.....	4 00
Best bon-bon, second premium, Carrie F. Mosteller, Newark, Ohio	2 00
Decorated tray, Carrie F. Mosteller, Newark, Ohio.....	2 00
Second premium, May Greenleaf, Indianapolis, Ind.....	1 00
Tapestry, hall decoration, Miss Minnie B. Akass, Chicago, Ill....	3 00
Second premium, Miss Cornelia Warner, Crawfordsville Ind.....	2 00

CLASS LII—Art Work. Paintings and Drawings, Amateur.

(Mrs. Flora Williamson, Judge, Logansport, Ind.)

Portrait, oil, Mrs. Clinton Hall, Indianapolis, Ind.....	\$10 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	5 00
Portrait, crayon, Miss Minnie B. Akass, Chicago, Ill.....	4 00
Second premium, James Ritchey Indianapolis Ind.....	2 00
Portrait, pastel, Mrs. George Sands, Kokomo, Ind.....	4 00
Second premium, Mrs. Harriett Van Horn, Indianapolis, Ind.....	2 00
Portrait, water color, Miss Minnie B. Akass, Chicago, Ill.....	6 00
Second premium, Mrs. Clinton Hall, Indianapolis, Ind.....	3 00
Ideal head, oil, Miss Minnie B. Akass, Chicago, Ill.....	2 00

Second premium, Mrs. Clinton Hall, Indianapolis, Ind.....	1 00
Ideal head, crayon, Mrs. Clinton Hall, Indianapolis, Ind.....	2 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	1 00
Ideal head, water color, Mrs. Clinton Hall, Indianapolis, Ind.....	2 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	1 00
Ideal head, pastel, Mrs. Clinton Hall, Indianapolis, Ind.....	2 00
Second premium, May Greenleaf, Indianapolis Ind.....	1 00
Group figure, oil, Miss Minnie B. Akass, Chicago, Ill.....	2 00
Second premium, Mrs. Clinton Hall, Indianapolis, Ind.....	1 00
Ideal figure, crayon, Mrs. Clinton Hall, Indianapolis, Ind.....	2 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	1 00
Group figure, water color, Miss Minnie B. Akass, Chicago, Ill.....	2 00
Second premium, Grace Greenleaf, Indianapolis, Ind.....	1 00
Ideal figure, pastel, Mrs. Clinton Hall, Indianapolis, Ind.....	2 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	1 00
Specimen flowers, in oil, Miss Minnie B. Akass, Chicago, Ill.....	2 00
Second premium, Mrs. Clinton Hall, Indianapolis, Ind.....	1 00
Display flowers, in oil, Mrs. Clinton Hall, Indianapolis, Ind.....	4 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	2 00
Specimen flowers, water color, Mrs. Clinton Hall, Indianapolis, Ind.	2 00
Second premium, Minnie Austin, Crawfordsville, Ind.....	1 00
Specimen, fruit in oil, Mrs. Clinton Hall, Indianapolis, Ind.....	2 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	1 00
Specimen, fruit in water color, Mrs. Clinton Hall, Indianapolis, Ind.	2 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	1 00
Specimen, vegetable, in oil, Mrs. Chas. Railsback, Indianapolis, Ind.	2 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	1 00
Specimen, vegetable, water color, Mrs. Clinton Hall, Indianapolis, Ind.	2 00
Second premium, Minnie Austin, Crawfordsville, Ind.....	1 00
Display, fruit or vegetable, in oil, Mrs. Clinton Hall, Indianapolis, Ind.	4 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	2 00
Display, fruit or vegetable, water color, Mrs. Clinton Hall, Indian- apolis, Ind.....	4 00
Second premium, Harry Coffy, Indianapolis, Ind.....	2 00
Specimen, animal in oil, Miss Minnie B. Akass, Chicago, Ill.....	2 00
Second premium, Mrs. Clinton Hall, Indianapolis, Ind.....	1 00
Specimen, animal in water colors, Mrs. Clinton Hall, Indianapolis, Ind.	2 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	1 00
Specimen, game, in oil, Mrs. Clinton Hall, Indianapolis, Ind.....	2 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	1 00
Specimen, game, in water colors, Mrs. Clinton Hall, Indianapolis, Ind.	2 00

Second premium, Miss Minnie B. Akass, Chicago, Ill.....	1 00
Specimen, game, pastel, Mrs. Clinton Hall, Indianapolis, Ind.....	2 00
Specimen, still life, in oil, Mrs. Clinton Hall, Indianapolis, Ind.....	2 00
Second premium, Myrtle L. Taylor, Indianapolis, Ind.....	1 00
Specimen, still life, water color, Mrs. Clinton Hall, Indianapolis, Ind.	2 00
Second premium, May Greenleaf, Indianapolis, Ind.....	1 00
Specimen, still life, pastel, Mrs. Clinton Hall, Indianapolis, Ind..	2 00
Second premium, Minnie Austin, Crawfordsville, Ind.....	1 00
Specimen, still life, crayon, Mrs. Clinton Hall, Indianapolis, Ind...	2 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	1 00
Specimen, landscape, in oil, Miss Minnie B. Akass, Chicago.....	2 00
Second premium, Mrs. Clinton Hall, Indianapolis, Ind.....	1 00
Specimen, landscape, water color, Mrs. Clinton Hall, Indianapolis, Ind.	2 00
Second premium, Miss Minnie B. Akass Chicago, Ill.....	1 00
Specimen, landscape, pastel, Mrs. Clinton Hall, Indianapolis, Ind.	2 00
Second premium, Mrs. Willis Fugate, Indianapolis, Ind.....	1 00
Specimen, landscape, crayon, Mrs. Clinton Hall, Indianapolis, Ind.	2 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	1 00
Display, landscape paintings, six pictures, Mrs. Clinton Hall, Indianapolis, Ind.....	6 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	3 00
Summer scene, in oil, Mrs. Clinton Hall, Indianapolis, Ind.....	2 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	1 00
Summer scene, in water color, Mrs. Clinton Hall, Indianapolis, Ind.	2 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	1 00
Autumn scene, in oil, Mrs. Clinton Hall, Indianapolis, Ind.....	2 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	1 00
Autumn scene, in water colors, Miss Minnie B. Akass, Chicago...	2 00
Second premium, James Ritchey, Indianapolis, Ind.....	1 00
Winter scene, in oil, Mrs. Clinton Hall, Indianapolis, Ind.....	2 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	1 00
Winter scene, in water color, Mrs. Clinton Hall, Indianapolis, Ind.	2 00
Second premium, Carrie F. Mosteller, Newark, Ohio.....	1 00
Marine scene, in oil, Mrs. Clinton Hall, Indianapolis, Ind.....	2 00
Second premium, Mrs. Clinton Hall, Indianapolis, Ind.....	1 00
Marine scene, in water colors, Mrs. Clinton Hall, Indianapolis, Ind.	2 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	1 00
Interior scene, in oil, Mrs. Clinton Hall, Indianapolis, Ind.....	2 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	1 00
Interior scene, in water colors, Mrs. Clinton Hall, Indianapolis, Ind.	2 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	1 00

Specimen, pencil drawing. H. C. Summers. Irvington, Ind.....	2 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	1 00
Specimen, pen and ink sketch, Mrs. Clinton Hall, Indianapolis, Ind.	2 00
Second premium, May Greenleaf, Indianapolis, Ind.....	1 00
Display, pen and ink sketch, Mrs. Clinton Hall, Indianapolis, Ind.	4 00
Second premium. Miss Minnie B. Akass, Chicago, Ill.....	2 00
Specimen drawing. copy, Mrs. Clinton Hall, Indianapolis, Ind....	2 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	1 00
Specimen, drawing, original, Miss Minnie B. Akass, Chicago, Ill..	2 00
Second premium Mrs. Clinton Hall Indianapolis Ind.....	1 00
Specimen in sepia. fancy head or figure, Mrs. Clinton Hall, Indianapolis, Ind.....	2 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	1 00
Drawing, architectual, Lena L. Ingraham, Indianapolis, Ind.....	2 00
Mechanical drawing, Lena L. Ingraham, Indianapolis, Ind.....	2 00
Display, charcoal drawing, Lena L. Ingraham, Indianapolis, Ind..	4 00
Drawing, charcoal, from life, Miss Minnie B. Akass, Chicago.....	4 00
Second premium, Mrs. Clinton Hall, Indianapolis, Ind.....	2 00
Painting, grain, in oil, Mrs. Clinton Hall, Indianapolis, Ind.....	2 00
Second premium. Mrs. Chas. Railsback. Indianapolis, Ind.....	1 00
Painting, monochrome, oil, Miss Minnie B. Akass, Chicago, Ill....	2 00
Second premium. Mrs. Clinton Hall, Indianapolis, Ind.....	1 00
Best entire exhibit. paintings and drawings. Mrs. Clinton Hall, Indianapolis, Ind.....	10 00
Second premium, Miss Minnie B. Akass, Chicago, Ill.....	5 00

CLASS LIII—Art Work. Paintings and Drawings, Professional.

(Mrs. Flora Williamson, Judge, Logansport, Ind.)

Portrait, in oil. Tice Temple, Indianapolis, Ind.....	\$15 00
Second premium. C. E. Spahr, Indianapolis, Ind.....	8 00
Portrait, in water color, Mrs. E. M. Ingraham, Indianapolis, Ind..	10 00
Second premium, Mrs. E. M. Ingraham, Indianapolis, Ind.....	5 00
Portrait, in crayon, C. E. Spahr, Indianapolis, Ind.....	6 00
Second premium, Marie E. Moran, Indianapolis, Ind.....	3 00
Portrait, in pastel, Mrs. Marie Folger, Indianapolis, Ind.....	10 00
Second premium. Mrs. Marie Folger, Indianapolis, Ind.....	5 00
Ideal head, in oil, C. E. Spahr, Indianapolis, Ind.....	6 00
Second premium, Tice Temple, Indianapolis, Ind.....	3 00
Ideal head, in water color, C. E. Spahr, Indianapolis, Ind.....	4 00
Second premium. C. E. Spahr, Indianapolis, Ind.....	2 00
Ideal figure, in oil, Mrs. Harry Cummings, Chicago, Ill.....	6 00
Second premium, C. E. Spahr, Indianapolis, Ind.....	3 00
Group figure, in oil, Mrs. Harry Cummings, Chicago, Ill.....	6 00
Second premium, Mrs. Marie Folger, Indianapolis, Ind.....	3 00

Ideal figure, in water color, C. E. Spahr, Indianapolis, Ind.....	4 00
Second premium, Imogene Brown, Crawfordsville, Ind.....	2 00
Group figure, in water color, C. E. Spahr, Indianapolis, Ind.....	4 00
Second premium, Mrs. Harry Cummings, Chicago, Ill.....	2 00
Specimen, flowers, in oil, C. E. Spahr, Indianapolis, Ind.....	4 00
Second premium, Minnie Hines, Indianapolis, Ind.....	2 00
Display, flowers, in oil, Mrs. Harry Cummings, Chicago, Ill.....	6 00
Second premium, Mrs. E. M. Ingraham, Indianapolis, Ind.....	3 00
Specimen, flowers, in water color, Mrs. W. S. Day, Indianapolis, Ind.	4 00
Second premium, Mrs. W. S. Day, Indianapolis, Ind.....	2 00
Display, flowers, in water color, Myrtle L. Taylor, Indianapolis, Ind.	6 00
Second premium, Mrs. Marie Folger Indianapolis, Ind.....	3 00
Specimen, fruit, in oil, C. E. Spahr, Indianapolis, Ind.....	4 00
Second premium, Mrs. Harry Cummings, Chicago, Ill.....	2 00
Specimen fruit, in water color, Mrs. W. S. Day, Indianapolis, Ind.	4 00
Second premium, Mrs. Marie Folger, Indianapolis, Ind.....	2 00
Specimen, vegetable, in oil, G. V. Strauss, Crawfordsville, Ind....	4 00
Second premium, G. V. Strauss, Crawfordsville, Ind.....	2 00
Vegetable, in water color, Mrs. Marie Folger, Indianapolis, Ind...	4 00
Second premium, Mrs. Marie Folger, Indianapolis, Ind.....	2 00
Display, fruit or vegetable, in oil, Minnie Hines, Indianapolis, Ind.	6 00
Second premium, C. E. Spahr, Indianapolis, Ind.....	3 00
Display, fruit or vegetable, in water color, Imogene Brown, Crawfordsville, Ind.....	6 00
Second premium, Mrs. E. M. Ingraham, Indianapolis, Ind.....	3 00
Animal, in oil, Mrs. Harry Cummings, Chicago, Ill.....	4 00
Second premium, Mrs. Marie Folger, Indianapolis, Ind.....	2 00
Animal, in water color, Mrs. Harry Cummings, Chicago, Ill.....	4 00
Second premium, C. E. Spahr, Indianapolis, Ind.....	2 00
Game, in oil, Mrs. Marie Folger, Indianapolis, Ind.....	4 00
Second premium, C. E. Spahr, Indianapolis, Ind.....	2 00
Game, in water color, Mrs. Marie Folger, Indianapolis, Ind.....	4 00
Second premium, C. E. Spahr, Indianapolis, Ind.....	2 00
Game, in pastel, second premium, H. W. Barnitz, Urbana, Ohio....	2 00
Still life, in oil, G. V. Strauss, Crawfordsville, Ind.....	4 00
Second premium, Mrs. Marie Folger, Indianapolis, Ind.....	2 00
Still life, in water color, G. V. Strauss, Crawfordsville, Ind.....	4 00
Second premium, C. E. Spahr, Indianapolis, Ind.....	2 00
Still life, pastel, Mrs. Marie Folger, Indianapolis, Ind.....	4 00
Second premium, Marie E. Moran, Washington, D. C.....	2 00
Still life, in crayon, Mrs. E. M. Ingraham, Indianapolis, Ind.....	4 00
Second premium, H. W. Barnitz, Urbana, Ohio.....	2 00
Landscape, in oil, G. V. Strauss, Crawfordsville, Ind.....	4 00

Second premium, G. V. Strauss, Crawfordsville, Ind.....	2 00
Landscape, in water color, Mrs. Marie Folger, Indianapolis, Ind..	4 00
Second premium, Mrs. W. S. Day, Indianapolis, Ind.....	2 00
Landscape, in pastel, Mrs. Marie Folger, Indianapolis, Ind.....	4 00
Second premium, Marie E. Moran, Washington, D. C.....	2 00
Landscape, in crayon, C. E. Spahr, Indianapolis, Ind.....	4 00
Second premium, Mrs. Harry Cummings, Chicago, Ill.....	2 00
Display, Landscape painting, C. E. Spahr, Indianapolis, Ind.....	6 00
Second premium, Mrs. Harry Cummings, Chicago, Ill.....	3 00
Interior scene, in oil, Mrs. Marie Folger, Indianapolis, Ind.....	4 00
Second premium, C. E. Spahr, Indianapolis, Ind.....	2 00
Interior scene, in water color, Mrs. Harry Cummings, Chicago, Ill.	4 00
Second premium, C. E. Spahr, Indianapolis, Ind.....	2 00
Drawing, from antique, head, C. E. Spahr, Indianapolis, Ind.....	4 00
Second premium, C. E. Spahr, Indianapolis, Ind.....	2 00
Drawing, from antique, figure, C. E. Spahr, Indianapolis, Ind.....	4 00
Second premium, C. E. Spahr, Indianapolis, Ind.....	2 00
Drawing, animal, C. E. Spahr, Indianapolis, Ind.....	4 00
Second premium, C. E. Spahr, Indianapolis, Ind.....	2 00
Drawing, architectural, Mrs. E. M. Ingraham, Indianapolis, Ind...	4 00
Drawing, mechanical, Mrs. E. M. Ingraham, Indianapolis, Ind....	4 00
Pen and ink drawing, Mrs. Marie Folger, Indianapolis, Ind.....	4 00
Second premium, Marie E. Moran, Washington, D. C.....	2 00
Wash drawing, in black and white, Mrs. Marie Folger, Indian- apolis, Ind.....	4 00
Second premium, H. W. Barnitz, Urbana, Ohio.....	2 00
Charcoal drawing, Mrs. Harry Cummings, Chicago, Ill.....	3 00
Second premium, Mrs. E. M. Ingraham, Indianapolis, Ind.....	2 00
Illustrated poem, C. E. Spahr, Indianapolis, Ind.....	8 00
Second premium, Mrs. Harry Cummings, Chicago, Ill.....	4 00
Best entire exhibit, paintings and drawings, Mrs. Marie Folger, Indianapolis, Ind.....	10 00
Second premium, C. E. Spahr, Indianapolis, Ind.....	5 00

CLASS LIV—Art Work, China, Amateur.

(Mrs. Flora Williamson, Judge, Logansport, Ind.)

Painting on china, Dresden, Mrs. Willis Fugate, Indianapolis, Ind.	\$2 00
Second premium, Mrs. G. Coughlin, Indianapolis, Ind.....	1 00
Painting on china, Persian, specimen, Mrs. Willis Fugate, Indian- apolis, Ind.....	2 00
Second premium, Mrs. Willis Fugate, Indianapolis, Ind.....	1 00
Painting on china, relief work, Miss Flora Greenstreet, Indian- apolis, Ind.....	2 00

Second premium, Miss Flora Greenstreet. Indianapolis. Ind.....	1 00
Painting on china, enamel, Miss Flora Greenstreet. Indianapolis. Ind.	2 00
Second premium, Miss Flora Greenstreet. Indianapolis. Ind.....	1 00
Painting on china, punch bowl, flowers, Mrs. Harry Schad. Indi- anapolis. Ind.....	4 00
Painting on china, tankard, figure, Miss Margaret Shover, Indian- apolis, Ind.....	4 00
Painting on china, tankard, flowers, Mrs. Willis Fugate, Indian- apolis, Ind.....	4 00
Second premium, Elinor Ford, Indianapolis, Ind.....	2 00
Painting on china, claret pitcher, Mrs. E. P. Thayer. Greenfield. Ind.	4 00
Second premium, Mrs. Harry Schad, Indianapolis, Ind.....	2 00
Painting on china, jardiniere, figure, second premium, Mrs. E. P. Thayer, Greenfield, Ind.....	2 00
Painting on china, jardiniere, flowers, Mrs. G. Coughlin, Indian- apolis, Ind.....	4 00
Second premium, Mrs. Willis Fugate, Indianapolis, Ind.....	2 00
Painting on china, Doulton, specimen, second premium, Mrs. E. P. Thayer, Greenfield, Ind.....	2 00
Painting on china, fruit set, compote and plates, Mrs. W. A. Ford. Indianapolis. Ind.....	4 00
Second premium, Mrs. Harriett Van Horn, Indianapolis, Ind.....	2 00
Painting on china, chocolate set, Mrs. Willis Fugate, Indianapolis, Ind.	4 00
Second premium, Mrs. Harry Schad, Indianapolis, Ind.....	2 00
Painting on china, soup set, Mrs. G. Coughlin, Indianapolis, Ind..	4 00
Second premium, Myrtle L. Taylor, Indianapolis, Ind.....	2 00
Painting on china, pudding set, Mrs. Willis Fugate, Indianapolis, Ind.	4 00
Second premium, Daisy C. Altland, Indianapolis, Ind.....	2 00
Painting on china, manicure set, Mrs. Willis Fugate, Indianapolis. Ind.	4 00
Second premium, Mrs. Maude Everett, Indianapolis, Ind.....	2 00
Painting on china, ideal head, C. E. Spahr, Indianapolis, Ind.....	2 00
Second premium, Elinor Ford, Indianapolis, Ind.....	1 00
Painting on china, ideal head, C. E. Spahr, Indianapolis. Ind.....	2 00
Second premium, Miss Margaret Shover, Indianapolis, Ind.....	1 00
Painting on china, ideal figure, C. E. Spahr, Indianapolis, Ind....	2 00
Second premium, Miss Margaret Shover, Indianapolis. Ind.....	1 00
Painting on china, portrait, C. E. Spahr, Indianapolis. Ind.....	4 00
Second premium, C. E. Spahr, Indianapolis, Ind.....	2 00
Painting on china, dusted tinting, Mrs. Willis Fugate, Indian- apolis, Ind.....	4 00

Second premium, Miss Flora Greenstreet, Indianapolis, Ind.....	2 00
Best entire exhibit china paintings, Miss Flora Greenstreet, Indianapolis, Ind.....	10 00
Second premium, Mrs. Willis Fugate, Indianapolis, Ind.....	5 00

CLASS LV—Art Work. China. Professional.

(Mrs. Flora Williamson, Judge, Logansport, Ind.)

Painting on china, Dresden, special, Mrs. J. J. Garver, Indianapolis, Ind.....	\$4 00
Second premium, Mrs. William Welch, Irvington, Ind.....	2 00
One-half painting on china, Persian, specimen. Mrs. Minnie Wilcox, Indianapolis, Ind.....	4 00
Second premium, Mrs. William Welch, Indianapolis, Ind.....	2 00
Painting on china, lamp, M. J. Julian, Indianapolis, Ind.....	4 00
Second premium, M. J. Julian, Indianapolis, Ind.....	2 00
Painting on china, ornamental pieces, Mrs. W. S. Day, Indianapolis, Ind.....	4 00
Second premium, M. J. Julian, Indianapolis, Ind.....	2 00
Painting on china, relief gold, Mrs. Minnie Wilcox, Indianapolis, Ind.	4 00
Second premium, Mrs. Minnie Wilcox, Indianapolis. Ind.....	2 00
Painting on china, Douulton, specimen, Mrs. W. S. Day, Indianapolis, Ind.....	4 00
Second premium, Mrs. William Welch, Indianapolis. Ind.....	2 00
Painting on china, enamel, Mrs. Minnie Wilcox, Indianapolis, Ind.	4 00
Second premium, Mrs. Minnie Wilcox, Indianapolis, Ind.....	2 00
Painting on china, tankard, flowers, Mrs. W. S. Day, Indianapolis, Ind.	4 00
Second premium, Mrs. William Welch, Indianapolis. Ind.....	2 00
Painting on china, tankard, figure, Mrs. W. S. Day, Indianapolis, Ind.	4 00
Second premium, Mrs. Wm. Welch, Indianapolis. Ind.....	2 00
Painting on china, punch bowl, flowers. Mrs. William Welch, Indianapolis, Ind.....	4 00
Painting on china, punch bowl, figures. Mrs. W. S. Day, Indianapolis, Ind.....	2 00
Jardiniere, flowers, Mrs. W. S. Day, Indianapolis. Ind.....	4 00
Second premium, Mrs. William Welch, Indianapolis. Ind.....	2 00
Jardiniere, figures, Mrs. W. S. Day, Indianapolis. Ind.....	4 00
Painting on china, claret pitcher, Mrs. W. S. Day, Indianapolis, Ind.	4 00
Second premium, Mrs. W. S. Day, Indianapolis, Ind.....	2 00
Painting on china, chocolate set, Mrs. W. S. Day, Indianapolis, Ind.	6 00
Second premium. M. J. Julian, Indianapolis. Ind.....	3 00

Painting on china, fruit set, M. J. Julian, Indianapolis, Ind.....	6 00
Second premium, Mrs. W. S. Day, Indianapolis, Ind.....	3 00
Painting on china, pudding set, M. J. Julian, Indianapolis, Ind....	6 00
Second premium, Mrs. William Welch, Indianapolis, Ind.....	3 00
Painting on china, soup set, Mrs. W. S. Day, Indianapolis, Ind....	6 00
Second premium, Mrs. Wm. Welch, Indianapolis, Ind.....	3 00
Painting on china, manicure set, Mrs. W. S. Day, Indianapolis, Ind.	6 00
Second premium, M. J. Julian, Indianapolis, Ind.....	3 00
One-half painting on china, six plates, Mrs. W. S. Day, Indian- apolis, Ind.....	6 00
Second premium, Mrs. J. J. Garver, Indianapolis, Ind.....	3 00
China of conventional design, M. J. Julian, Indianapolis, Ind.....	4 00
Second premium, Mrs. J. J. Garver, Indianapolis, Ind.....	2 00
Ideal head, china or porcelain, Mrs. W. S. Day, Indianapolis, Ind.	4 00
Second premium, Mrs. W. S. Day, Indianapolis, Ind.....	2 00
Ideal figure, china or porcelain, Mrs. W. S. Day, Indianapolis, Ind.	4 00
Second premium, Mrs. W. S. Day, Indianapolis, Ind.....	2 00
Portrait, china, Mrs. W. S. Day, Indianapolis, Ind.....	4 00
Second premium, Mrs. W. S. Day, Indianapolis, Ind.....	2 00
Painting on china, dusted tinting, Mrs. W. S. Day, Indianapolis, Ind.	4 00
Second premium, Mrs. Minnie Wilcox, Indianapolis, Ind.....	2 00
Best entire exhibit china paintings, W. S. Day, Indianapolis, Ind..	10 00
Second premium, M. J. Julian, Indianapolis, Ind.....	5 00

CLASS LVI—Table Luxuries.

(L. V. Robertson, Judge, South Bend, Ind.)

Fancy cheese, Miss L. Crandon, Greenwood, Ind.....	\$1 50
Maple syrup, in most marketable shape, Mrs. Jesse Bennett, Greensburg, Ind.....	2 00
Second premium, Mrs. P. D. Stagg, Greensburg, Ind.....	1 00
Maple sugar, Mrs. Jesse Bennett, Greensburg, Ind.....	2 00
Second premium, Mrs. P. D. Stagg, Greensburg, Ind.....	1 00
Bread, wheat, yeast, Flora J. Hoss, Indianapolis, Ind.....	1 50
Second premium, Mrs. Harry Schad, Indianapolis, Ind.....	75
Bread, wheat, salt-rising, Mrs. E. A. Drake, Edinburg, Ind.....	1 50
Second premium, Gertrude M. Sargent, Lawrence, Ind.....	75
Graham bread, yeast, Mrs. C. Bryson, Indianapolis, Ind.....	1 50
Second premium, Mrs. O. McGannon, Indianapolis, Ind.....	75
Boston brown bread, Mary Faught, Indianapolis, Ind.....	1 50
Second premium, Flora J. Hoss, Indianapolis, Ind.....	75
Rusk, Miss Rosa Spires, Indianapolis, Ind.....	1 50
Second premium, Helen Kellehu, Mapleton, Ind.....	75

Corn pone, Miss Laura Hollingsworth, Indianapolis, Ind.....	1 50
Second premium, Mrs. W. A. Ford, Indianapolis, Ind.....	75
Dozen rolls, Flora J. Hoss, Indianapolis, Ind.....	1 50
Second premium, Mrs. O. McGannon, Indianapolis, Ind.....	75
Ginger bread, Alice V. Hatton, Indianapolis, Ind.....	1 50
Second premium, Mrs. O. McGannon, Indianapolis, Ind.....	75
Ginger cookies, Mrs. O. McGannon, Indianapolis, Ind.....	1 00
Second premium, Mrs. Maude Everett, Indianapolis, Ind.....	50
Fig cake, Mrs. V. L. Wilson, Connersville, Ind.....	1 50
Layer cake, carmel, orange, Mrs O. McGannon, Indianapolis, Ind.	1 50
Second premium, Mrs. V. L. Wilson, Connersville, Ind.....	75
Layer cake, carmel, chocolate, Mrs. V. L. Wilson, Connersville, Ind.	1 50
Second premium, Mrs. C. R. Myers, Whiteland, Ind.....	75
Marble loaf cake, Mrs V. L. Wilson, Connersville, Ind.....	1 50
Second premium Mrs. O. McGannon Indianapolis, Ind.....	75
White mountain cake, Mrs. O. McGannon, Indianapolis, Ind.....	1 50
Second premium, Mrs. W. A. Ford, Indianapolis, Ind.....	75
Cocoanut cake, Mary Faught, Indianapolis, Ind.....	1 50
Second premium, Mrs. C. D. Aughinbaugh, Indianapolis, Ind.....	75
Sunshine cake, Mrs. B. A. Boyd, Indianapolis, Ind.....	1 50
Second premium, Mrs. C. D. Aughinbaugh, Indianapolis, Ind.....	75
Angel's food, Mrs. J. Dunlap, Lafayette, Ind.....	1 50
Second premium, Lon A. Hornbeck, Indianapolis, Ind.....	75
Hickory nut loaf cake, Mrs. O. McGannon, Indianapolis, Ind.....	1 50
Second premium, Mrs. Marion Maule, Indianapolis, Ind.....	75
Hickory nut layer cake, Mrs. O. McGannon, Indianapolis, Ind.....	1 50
Second premium, Mrs. V. L. Wilson, Connersville, Ind.....	75
Fruit cake, Mrs O. McGannon, Indianapolis, Ind.....	3 00
Second premium, Mary Faught, Indianapolis, Ind.....	2 00
White fruit cake, Mrs. O. McGannon, Indianapolis, Ind.....	1 50
Second premium, Mrs. V. L. Wilson, Connersville, Ind.....	75
White cake, Mrs. C. R. Myers, Whiteland, Ind.....	1 50
Second premium, Mrs. O. McGannon, Indianapolis, Ind.....	75
Chocolate cake, layer, Mrs. O. McGannon, Indianapolis, Ind.....	2 00
Second premium, Mrs. T. M. Porter, Indianapolis, Ind.....	1 00
Chocolate cake, loaf, Mrs. J. C. Lowe, Indianapolis, Ind.....	2 00
Second premium, Miss Flora Harris, Rensselaer, Ind.....	1 00
Perfection cake, Mrs. J. C. Lowe, Indianapolis, Ind.....	1 50
Second premium, Mrs. V. L. Wilson, Connersville, Ind.....	75
Crullers, Helen Kellehu, Mapleton, Ind.....	1 50
Second premium, Mrs. T. M. Porter, Indianapolis, Ind.....	75
Cream puff, Flora J. Hoss, Indianapolis, Ind.....	1 50
Second premium, Mrs. W. A. Ford, Indianapolis, Ind.....	75
Cookies, Mrs. J. L. Drake, Beech Grove, Ind.....	1 50
Second premium, Mrs. O. McGannon, Indianapolis, Ind.....	75

Kisses, Helen Kellehu, Mapleton, Ind.....	1 50
Second premium, Mrs. J. B. Powers, Indianapolis, Ind.....	75
Meringues, Mrs. W. A. Ford, Indianapolis, Ind.....	1 50
Second premium, Miss Laura Hollingsworth, Indianapolis, Ind....	75
English plum pudding, Miss Laura Hollingsworth, Indianapolis, Ind.	1 50
Second premium, Mrs. W. A. Ford, Indianapolis, Ind.....	75
Cheese straws, Mrs. Marion Maule, Indianapolis, Ind.....	1 00
Second premium, Mary Faught, Indianapolis, Ind.....	50
Saratoga chips, Mrs. Marlon Maule, Indianapolis, Ind.....	1 00
Second premium, Mrs. J. B. Powers, Indianapolis, Ind.....	50
Spiced peaches, Flora J. Hoss, Indianapolis, Ind.....	1 00
Second premium, Bettie Clore, Bargersville, Ind.....	50
Spiced pears, Bettie Clore, Bargersville, Ind.....	1 00
Second premium, Rosa Eastes, Mt. Comfort, Ind.....	50
Spiced cherries, Bettie Clore, Bargersville, Ind.....	1 00
Second premium, Mrs. J. C. Deathe, Indianapolis, Ind.....	50
Sweet pickles, collection, Mrs. V. L. Wilson, Connerville, Ind....	2 00
Second premium, Mrs. Will T. Hunter, Rising Sun, Ind.....	1 00
Pickles, mixed, Rosa Eastes, Mt. Comfort, Ind.....	1 50
Second premium, Flora J. Hoss, Indianapolis, Ind.....	75
Pickles, cucumber, Mrs. W. A. Ford, Indianapolis, Ind.....	1 50
Second premium, Rosa Eastes, Mt. Comfort, Ind.....	75
Peach pickles, Bettie Clore, Bargersville, Ind.....	2 00
Pear pickles, Bettie Clore, Bargersville, Ind.....	2 00
Second premium, Rosa Eastes, Mt. Comfort, Ind.....	1 00
Tomato catsup, not less than one pint, Flora J. Hoss, Indianapolis, Ind.	1 00
Second premium, Rosa Eastes, Mt. Comfort, Ind.....	50
Cucumber catsup, not less than one pint, Mrs. W. A. Ford, Indianapolis, Ind.....	1 00
Second premium, Mary J. Hoss, Indianapolis, Ind.....	50
Chili sauce, not less than one pint, Mrs. L. Smoot, Indianapolis, Ind.	1 00
Second premium, Mary Faught, Indianapolis, Ind.....	50
Boston baked beans, Mrs. B. A. Boyd, Indianapolis, Ind.....	1 00
Second premium, Mrs. J. C. Lowe, Indianapolis, Ind.....	50
Cranberry sauce, not less than one pint, Mrs. C. Bryson, Indianapolis, Ind.....	1 00
Second premium, Mrs. W. A. Ford, Indianapolis, Ind.....	50
Gelatine dessert, in any form, Mrs. J. B. Powers, Indianapolis, Ind.	1 50
Second premium, Mrs. W. A. Ford, Indianapolis, Ind.....	75
Collection of French candies, home-made, Mrs. J. B. Powers, Indianapolis, Ind.....	1 50
Second premium, Mrs. J. C. Lowe, Indianapolis, Ind.....	75

Collection taffies, home-made, Mrs. J. B. Powers, Indianapolis, Ind.	1 50
Second premium, Miss Laura Hollingsworth, Indianapolis, Ind....	75
Collection jellies, Mrs. V. L. Wilson, Connersville, Ind.....	3 00
Second premium, Mrs. Will T. Hunter, Rising Sun, Ind.....	2 00
Preserves, collection, not less than one pint each, Rosa Eastes, Mt. Comfort, Ind.....	3 00
Second premium, Mrs. B. A. Boyd, Indianapolis, Ind.....	2 00
Fruit butters, collection, not less than one pint each, Rosa Eastes, Mt. Comfort, Ind.....	3 00
Second premium, Bettie Clore, Bargersville, Ind.....	2 00
Canned fruit, collection, not less than one pint each, Mrs. V. L. Wilson, Connersville, Ind.....	5 00
Second premium, Rosa Eastes, Mt. Comfort, Ind.....	3 00

CLASS LVII--Professional Cooking.

(V. L. Robertson, Judge, South Bend, Ind.)

Best collection of cakes, three or more kinds.....	
Best collection of candies, five or more kinds, Miss Laura Hollingsworth, Indianapolis, Ind.....	2 00
Second premium, Mrs. J. B. Powers, Indianapolis, Ind.....	1 00
Fanciest gelatine dessert, Miss Hollingsworth, Indianapolis, Ind..	2 00
Second premium, Mrs. J. B. Powers, Indianapolis, Ind.....	1 00
Fancy bread for evening refreshments, Miss Laura Hollingsworth, Indianapolis, Ind.....	1 50
Second premium, Mrs. J. B. Powers, Indianapolis, Ind.....	75
Fancy dessert for evening refreshments, Miss Laura Hollingsworth, Indianapolis, Ind.....	1 00
Second premium, Mrs. J. B. Powers, Indianapolis, Ind.....	50
Fancy relish for evening refreshments, Mrs. J. B. Powers, Indianapolis, Ind.....	1 00
Second premium, Miss Laura Hollingsworth, Indianapolis, Ind....	50

CLASS LVIII--Miscellaneous.

(Mrs. Flora Williamson, Judge, Logansport, Ind.)

Outline quilt, Mrs. Rosa Busick, Kokomo, Ind.....	\$1 00
Irish chain, Mrs. A. McCord, McCordsville, Ind.....	1 00
Embroidery on buckskin, Mrs. W. Knippenburg, Indianapolis, Ind.	1 00
Hand quilting, Mrs. M. J. Brouse, Indianapolis, Ind.....	1 00

Dresser scarf, second premium, Miss Margaret Bryan, Indianapolis, Ind.....	50
Silk dress, second premium, Mrs. George Sands, Kokomo, Ind....	50
Worsted dress, second premium, Mrs. Rosa Busick, Kokomo, Ind.	50
Worsted wrapper, second premium, Mrs. Geo. Sands, Kokomo, Ind.	50
Hand painting, toilet skirt, second premium, Mrs. George Sands, Kokomo, Ind.....	50
Painting on chamols, second premium, Mrs. George Sands, Kokomo, Ind.....	50
Hemstitched sheet and pillow, Mrs. Rosa Busick, Kokomo, Ind...	50
Embroidered slipper case, Mrs. Rosa Busick, Kokomo, Ind.....	50
Fancy tidy, Mrs. George Sands, Kokomo, Ind.....	1 00
Second premium, Mrs. Rosa Busick, Kokomo, Ind.....	50
Dust bag, Mrs. Rosa Busick, Kokomo, Ind.....	1 00
Second premium, Mrs. George Sands, Kokomo, Ind.....	50
Hand-made portieres, Mrs. George Sands, Kokomo, Ind.....	1 00
Knit slippers, Mrs. George Sands, Kokomo, Ind.....	1 00
Second premium, Mrs. Rosa Busick, Kokomo, Ind.....	50
Ice wool shawl, Mrs. Rosa Busick, Kokomo, Ind.....	50
Painting on bolting cloth, Mrs. Alice Hartpence, Indianapolis, Ind.	50
Sun bonnet, Mrs. Rosa Busick, Kokomo, Ind.....	50
Bed set, Mrs. George Sands, Kokomo, Ind.....	1 00

Indiana and Its Progress Since 1816.

PREPARED BY

JNO. B. CONNER,

Chief of Indiana Bureau of Statistics.

PHYSICAL CONDITION AND WEALTH.

The frequent inquiries coming to the Bureau of Statistics, requiring diligent search through hundreds of miscellaneous volumes of documentary, legislative and other State reports to answer them, have suggested the gathering up of these fragments relating to the growth and progress of Indiana since its admission as a State into the Union in 1816, and putting together the salient things relating thereto, for more convenient reference. But even this work must be somewhat fragmentary, so far as it relates to the early periods of the State, for many things are obscure in the early records, and little or no indexing was done. Looking at present conditions, few of this generation of the citizens of Indiana realize what it was to be a citizen here eighty years ago, without railways, or telegraphs and other modern improvements which have so greatly changed both our material and social conditions.

PHYSICAL CONDITIONS.

At the close of the glacial period the territory included now in Indiana, physical conditions show, was nearly a level plain. In subsequent periods the force of the waters formed the present rivers of the State and their tributaries.

The accompanying relief map of the State shows the flow of the streams chiefly to the southwest, and in the long periods since the subsidence of the waters which once entirely covered the territory now composing the State, this flow to the southwest has greatly reduced the level of the western and southwestern territory, and made about one-third of

the land hilly, as represented on the map. While the highest level above the sea is now 1,053 feet in White River at Winchester, Randolph County, the lowest is 313 feet in the Ohio River at the mouth of the Wabash. The physical map showing the chief rivers of the State, with figures giving sea level, the hilly regions, etc., will afford the basis of an interesting study of some of the physical changes that have taken place in the many centuries past. The chief streams of the State have their source and many branches in the high level sections. The numerous tributaries of the several rivers have cut their way in deep channels in every section of the State, affording excellent natural drainage. When the State was admitted to the Union the high table lands abounded with numerous small lakes, swamps and marshes, and millions of acres then reckoned wholly worthless for agricultural purposes, with systems of artificial drains into these streams have now been reclaimed and are among the most valuable in the State. It was in part on account of this physical condition that the hill regions were first settled, and then reckoned alone inhabitable. There was little thought or knowledge of the topography of the State, or that these rich marsh lands lay high above the water courses of natural drainage, and so contiguous as to make reclamation an easy task by artificial drainage. Neither was there ability on the part of the early settlers, or law providing for systems of drainage even had there been better knowledge of the character of the lands. All these things came in due time, and open ditches have been supplemented with tile drainage till more than twenty counties lying on and north of an east and west line through Indianapolis, and now what was considered worthless lands have become most productive and valuable.

ADMISSION OF INDIANA INTO THE UNION.

Under the cession of Virginia to the general government, comprising the Northwest Territory, the Ordinance of 1787 provided that it should eventually be divided into not exceeding five States. Beginning with 1800 there were three schemes of the Indiana Territory, which embraced areas now comprised in other States. Indiana Territory, with the lines adjusted as they now comprise the State, was formed in 1808. The memorial of the Territorial Legislature of 1815 asked Congress to admit the State into the Union, representing that there were more than 60,000 free white inhabitants, as had been provided in the territorial ordinance as a condition of statehood. The census taken by the Legislature showed that there were 63,897 inhabitants, and so Congress provided for a constitutional convention, and the election of delegates thereto occurred May, 1816. The delegates elected to the Constitutional Convention met at Corydon June 10, 1816, the seat of government, and framed the first Constitution of Indiana, completing the work on the 29th of June, and so Indiana became a State in 1816.

MEMBERS OF THE FIRST CONSTITUTIONAL CONVENTION.

Wayne County—

Joseph Holman.
Patrick Baird.
Jeremiah Cox.
Hugh Cull.

Franklin County—

Robert Hanna, Jr.
James Brownlee.
Enoch McCartney.
James Noble.
William H. Eads.

Dearborn County—

Ezra Ferris.
Soloman Manwaring.
James Dill.

Switzerland County—

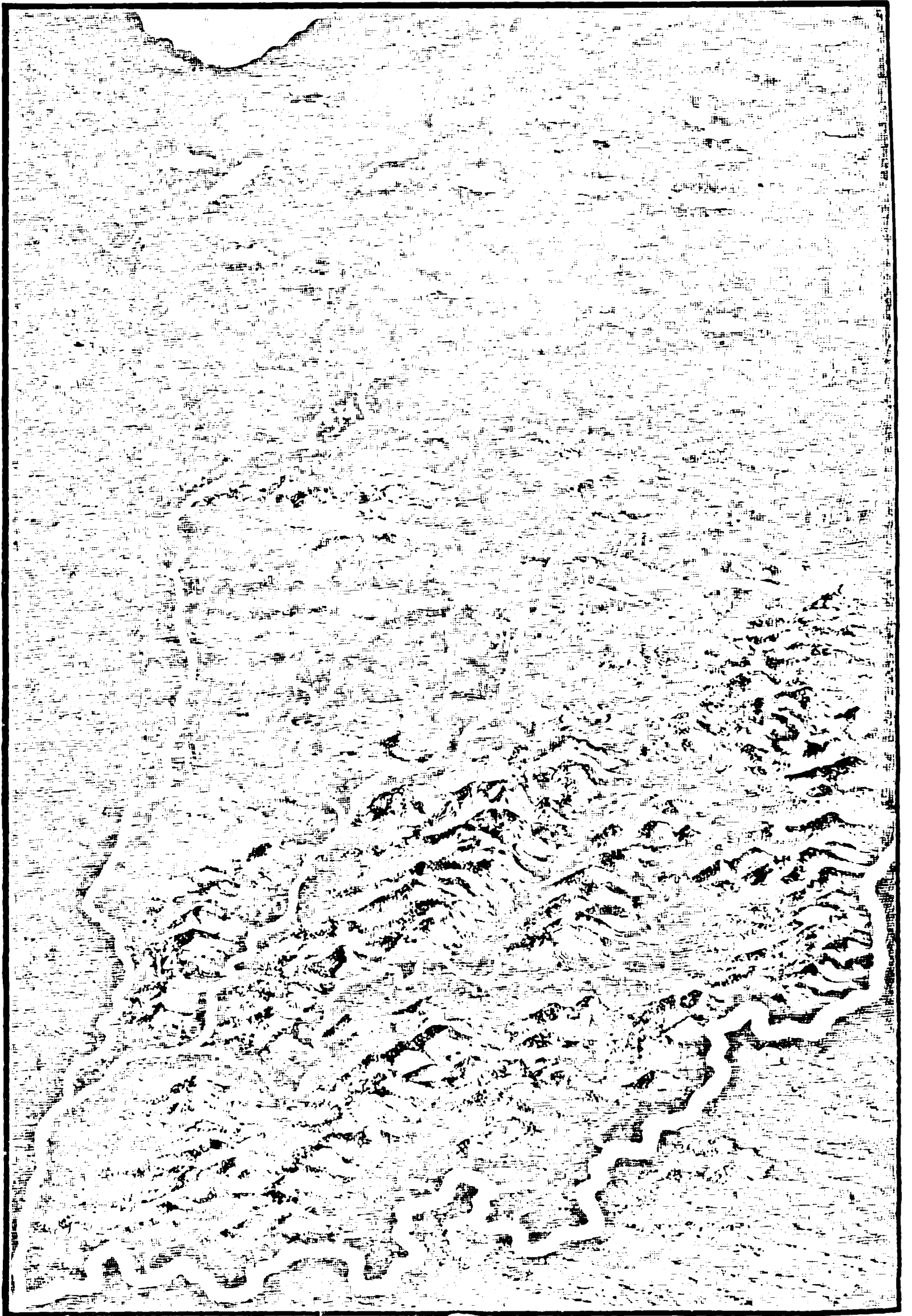
William Cotton.

Jefferson County—

David H. Maxwell.
Samuel Smock.
Nathaniel Hunt.

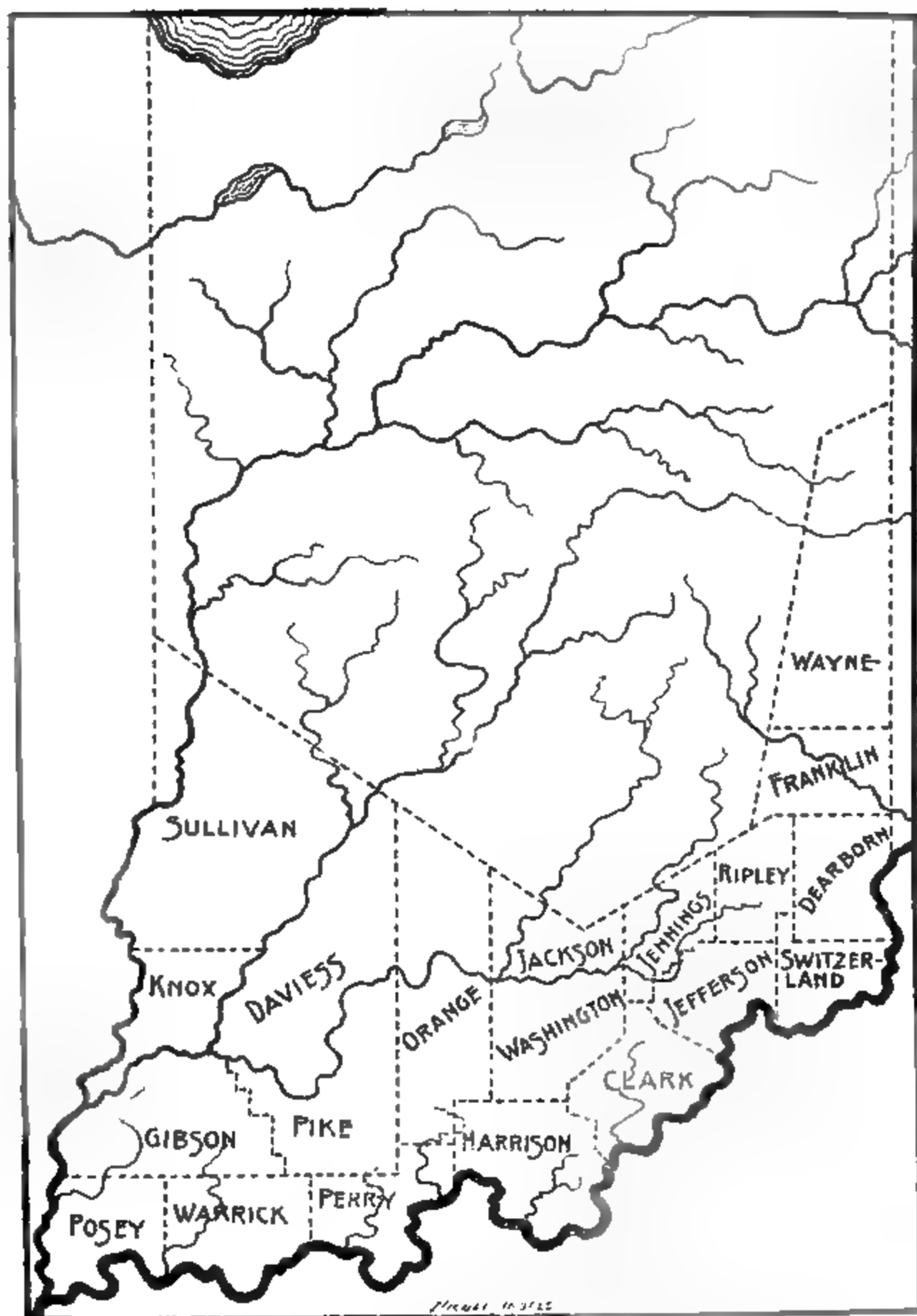
Clark County—

Jonathan Jennings.
Thomas Carr.
James Lemon.
James Scott.
Jno. K. Graham.



PHYSICAL MAP OF INDIANA.

Showing the principal rivers and their chief tributaries. Also giving the hill section of the State where the first settlements were made. The hills are somewhat exaggerated in order to show them in relief. The figures on the map give the elevations above sea level. The highest point is 1,053 feet, in Randolph County, on White River, and the lowest 313 feet, on the Ohio River, at the mouth of the Wabash. The territory comprising the State, once a level plain, with flow of water to the southwest, shows the influence of water in lowering the general elevation above sea level. In the northern section are also shown many of the largest lakes.



MAP OF INDIANA, 1817.

The map shows the partial settlement of the State in 1817. The counties named and the Indian boundary lines were drawn by John Melish in the year mentioned, the year after the admission of the State into the Union. It will be noticed that several counties are named on the map which did not participate in the Constitutional Convention of 1816, and may not at that date have been fully organized. The dotted lines to the north of these counties show Indian boundary lines. Several Indian tribes roamed over two-thirds of the State, and, being heavily timbered, it was their hunting grounds. The chief rivers and their largest tributaries only are shown on the map.

Harrison County—

Dennis Pennington.
 Daniel C. Lane.
 Davis Floyd.
 Patrick Shields.
 Jno. Boone.

Washington County—

Jno. DePauw.
 Samuel Milroy.
 William Graham.
 William Lowe.
 Robert McIntire.

Knox County—

Jno. Johnson.
 William Polke.

Jno. Badollet.

Jno. Benefiel.

Gibson County—

David Robb.
 Alexander Devin.
 James Smith.
 Frederick Rapp.

Posey County—

Dan Lynn.

Warrick County—

Daniel Grass.

Perry County—

Charles Polke.

JONATHAN JENNINGS President.

WILLIAM HENDRICKS Secretary.

Committee on Elections—

Noble.
 Johnson.
 Smith.
 Hanna.
 Holman.

Committee on Rules, Etc.—

Dill.
 Scott.
 Badollet.
 Polke, of Knox.
 Hunt.

Committee on Ways and Means—

Floyd.
 DePauw.
 Carr.

FORMATION OF CONSTITUTION.

Bill of Rights and Preamble—

Badollet.
 Manwaring.
 Graham, of Clark.
 Lane.
 Smith.
 Pennington.

Legislative Department—

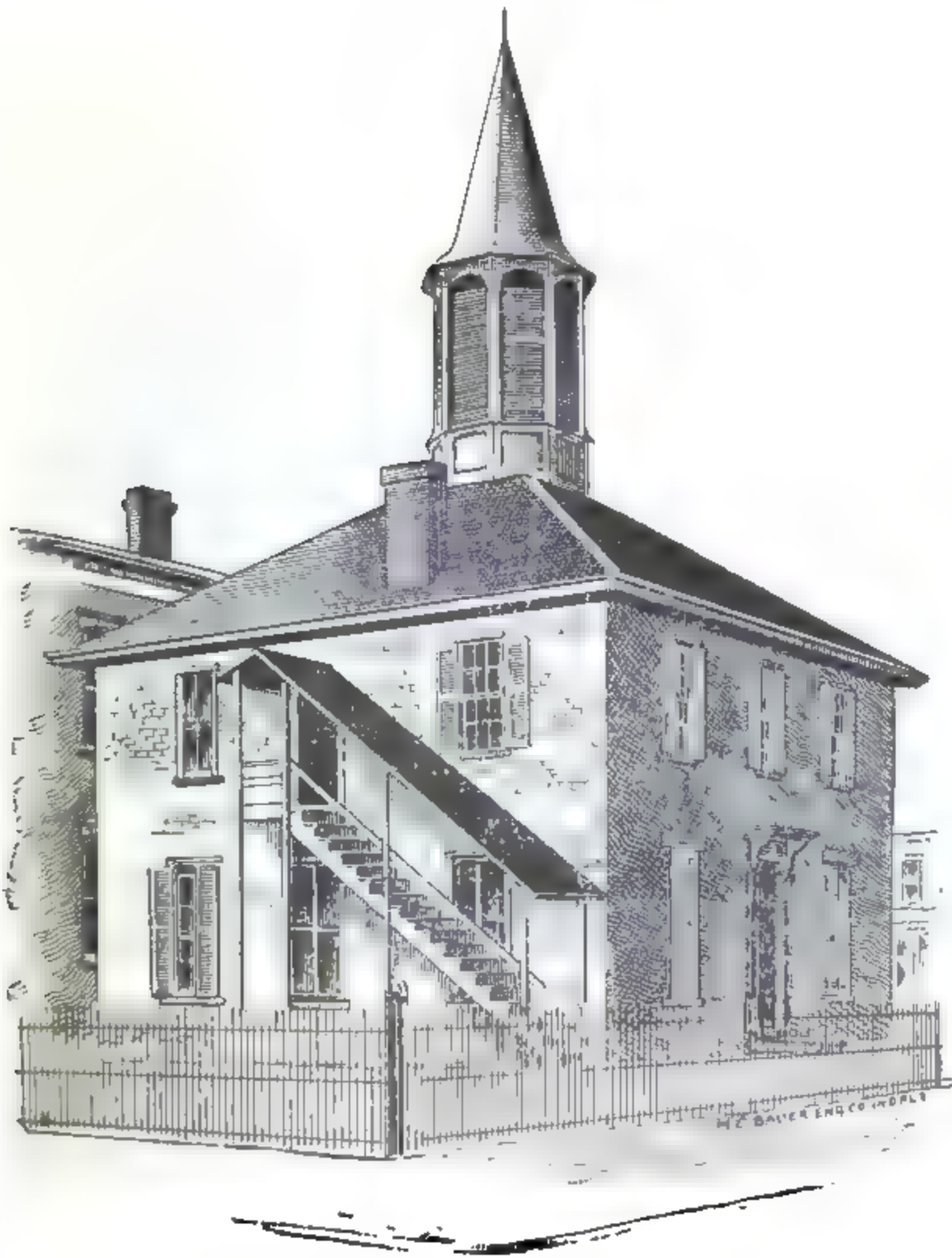
Noble.
 Ferris.
 Milroy.
 Benefiel.
 Grass.

Distribution of Powers of Government—

Johnson.
 Polke, of Perry.
 Floyd.
 Maxwell.
 McCartey.

Executive Department—

Graham, of Clark.
 Polke, of Knox.
 Rapp.
 Shields.
 Smock.
 Smith.
 Ferris.
 Brownlee.



STATE HOUSE AT CORYDON, 1816.

Was built in 1811 for the Territorial Legislature and offices. The building was not completed, however, till 1815. The State, admitted into the Union in 1816, occupied it till 1825. Here also the Constitutional Convention met to frame the first organic laws of the State. The building still stands, a solid old structure.

Judicial Department—

Scott.
Johnson.
Dill.
Milroy.
Noble.
Cotton.
Lowe.

Impeachments—

Dill.
Cox.
Hunt.
Eads.
Carr.

All other provisions not above mentioned—

Maxwell.
DePauw.
Robb.
Scott.
Baird.

Mode of Revision—

Hanna.
Pennington.
Devin.
Johnson.
Graham, of Washington.

Change of Government—

Floyd.
Holman.

McIntire.
Manwaring.
Benefiel.

Education—

Scott.
Badollet.
Polke, of Knox.
Lynn.
Boone.

Militia—

Dill.
Hanna.
Carr.
Cotton.
Robb.
Holman.
Cox.
DePauw.
Noble.
Rapp.
Benefiel.

Elections and Franchises—

Ferris.
Lemon.
Grass.
Polke, of Perry.
Cull.
Smith.
DePauw.

The Convention adjourned at 3 p. m., Saturday, June 29, 1816, without day, having completed it work.

EARLY TIMBER RESOURCES.

More than four-fifths of the State at its settlement was heavily timbered with the most valuable varieties of forest growth, such as many varieties of oak, and with poplar, walnut, cherry, ash, hard maple, elm, hickory, beech, cottonwood and more than one hundred other varieties. In the early years of settlement much of this timber was very large, as will be seen by the following measurements of several varieties.



THE CONSTITUTIONAL ELM AT CORYDON.

Under the old elm, still standing, was where the hot days of June, 1816, were chiefly spent by the delegates in their work of framing the first Constitution of Indiana, the Convention having adjourned from the old State House to the cooler shades of the elm tree. This tree still stands there with its widespreading branches, reaching 124 feet in diameter.

COMMON NAME.	Diameter.	Height to First Limbs.	Total Height.
Burr Oak	7 feet	72 feet	160 feet
Black Oak	6.5 "	75 "	165 "
White Oak	6 "	60 "	150 "
Black Walnut	7 "	74 "	155 "
Scarlet Oak	7 "	94 "	181 "
Poplar	8 "	91 "	190 "
Cottonwood	7 "	75 "	170 "
Sweet Gum	6 "	80 "	164 "
Sugar Maple	5 "	62 "	120 "

As there was little market for the fine natural forest timber, what would now be worth billions of dollars was destroyed by burning, and used for fence rails, in order to get it off the land and out of the way for cultivation. There are but two or three fractional sections now not yet culled of the largest and best timber. No very accurate statistical information was ever obtained of the annual production of lumber in the State till 1897, which was then collected as far as possible for the report of this Bureau.

COAL, NATURAL GAS, PETROLEUM, STONE AND CLAYS.

Until 1860 it was not generally believed that the coal measures of Indiana were of much consequence. Since that date the geological surveys have shown that the area is 7,500 square miles, lying in the western and southwestern part of the State.

The varieties are block, bituminous and cannel, but only a small area of the latter. Referring to these natural resources, Prof. Blatchley, the State Geologist, says that in 1897 Indiana stood sixth among the States in the production of coal, fourth in petroleum, second in natural gas, seventh in building stone and sixth in the value of her clay resources, and that the value of these five products of the State in 1897 was \$16,309,793. No accurate record of the coal output was kept until 1879. The following will show the trend of development of the coal resources since that date:

1880 coal output, tons.....	1,750,000
1890 coal output, tons.....	3,720,497
1897 coal output, tons.....	4,228,085

It is estimated that the output for 1898 will exceed 6,000,000 tons, as the demand has greatly increased since 1897.

The oolitic limestone area of the State, so well known and so largely used for building purposes, is 1,180 square miles, lying in a strip averaging about five miles in width, in the southwestern part of the State, and extending from Putnam County to the Ohio River. Lawrence County is the center of development in this industry. Prior to 1860 it was only

locally used, though its value was discovered in 1830. Until 1860 no record was made of its output. The following will indicate the growing demand for this stone:

1860, value of output.....	\$64,000
1870, value of output.....	372,000
1880, value of output.....	810,000
1890, value of output.....	1,180,000
1897, value of output.....	2,300,000

The output of 1896 embraced over 17,000 carloads at the six leading quarries.

The red and brown sandstones, with a very considerable area in Putnam, Greene and Dubois counties chiefly, stand next to the oolitic, perhaps, in quality and value for building purposes, though not yet extensively developed. The State has very large resources in other varieties of limestone.

Only in the past five or six years have the fine commercial clays and shales of Indiana attracted attention. The State Geologist reports that these are in great abundance and of fine quality for terra cotta, sewer pipe, and for road building. Geologists also pronounce the extensive deposits of kaolin in Lawrence County of very fine quality for porcelain ware and many other uses.

The natural gas and petroleum area is 4,000 square miles, and the value of the output of the former in 1897 was \$5,043,635. Of the latter 136,634 barrels of oil were produced in 1891, and that had increased to 4588,290 in 1896. The Geologist says this output has since greatly increased. Noting in general terms these several natural resources, the State Geologist says they are now being developed at the rate of nearly twenty millions of dollars annually, chiefly by outside capital.

DEBT, TAXATION AND WEALTH.

The map of the State, drawn by Jno. Melish, in 1817, given elsewhere, shows the counties organized at that time, twenty in all, being a little more than one-third of the area, and chiefly in the hill regions. The dotted lines on the north of these counties were the Indian Boundary Lines, and the territory north of these was the homes of several Indian tribes, with white settlements in a few places, and several trading posts. These twenty counties were the beginnings of the State organization of 1817, the year following admission to the Union. These sparsely organized settlements then embraced a population of about 64,000, upon whom the burdens of taxation for State administration rested. Here was the basis and methods of valuation for that purpose, the ratings on land being as follows:

YEARS.	Acres.	First Class.	Second Class.	Third Class.
1817.	100	\$1 00	\$0 87½	\$0 50
1818.	100	1 00	87½	62½
1821.	100	1 50	1 25	75
1824.	100	1 50	1 00	75
1831.	100	80	60	40

Each bond servant, twelve years old and over, was also taxed \$3.00. In addition to this, county taxation levied 37.5 cents on each horse, mule and ass over three years old, and a special tax on each stallion. Each tavern, as hotels were then called, ten to twenty dollars, according to value. Each ferry across streams, \$5.00 to \$20.00. Town lots, 50 cents on each \$100 valuation. Bank stock was also added to the taxable lists at 25 cents per \$100. The rates on live stock and ferries were the same as in 1816 for county taxation, and there was added 50 cents on each court capias; each certificate of magistracy, 50 cents; each "pleasure carriage" with two wheels, \$1.00; each "pleasure carriage" with four wheels, \$1.25; each silver watch, 25 cents; each gold watch, 50 cents. Similar methods of taxation, with large discretion of public officers as to valuations, were maintained for many years, but there are only fragmentary records of it to be found.

LAND GRANTS AND INTERNAL IMPROVEMENTS.

The general government at various periods made grants of public lands to the State for specific purposes, such as for schools, universities, seat of State government, public improvements, etc., as follows:

PURPOSES OF GRANTS.	Acres.
Sixteenth section for common schools	631,863.71
University, colleges and seminaries in 1816	46,080.00
Saline lands in 1816	24,235.58
Seat of State government in 1819	2,560.00
Public improvements in 1827, 1841 and 1845.	1,439,379.41
Michigan Road in 1827	170,587.20
Swamp lands in 1850	1,209,422.09
Total.	3,524,022.99

The State in 1836 entered upon a most disastrous period of finances, in its internal improvement system, consisting of canal, turnpike and railway construction, begun at State expense. The general government in 1827 granted large bodies of land to the State for public improvements. Under the operation of this system of public improvement large amounts

of bonds were sold, and in this tremendous expansion of the State's credit extravagance in expenditure proceeded, and in 1840 the State, with a population of a little over 600,000 had plunged into a debt of \$18,469,146. This was a frightful condition of things, as even the interest on the debt was being paid out of the proceeds of bond sales. But in 1843-47 a settlement was effected with the creditors of the State, by turning over to a trustee the entire system of public improvements, lands, etc. The following table, beginning in 1840 with this tremendous State indebtedness, shows the debt career of the commonwealth, down to periods of wonderful natural development, increased population and great prosperity:

YEARS.	Population.	State Debt.	Debt per Capita.
1830	343,031		
1840	685,866	\$18,469,146	\$26 92
1850	988,416	6,712,880	6 79
1860	1,330,428	8,000,000	5 92
1870	1,680,637	7,818,710	4 65
1880	1,978,301	4,996,090	2 52
1890	2,192,404	8,538,059	3 89
1897	2,867,036	6,200,615	2 16

TAXABLE VALUES.

The progress in wealth is shown by the valuations for taxation, and its increase per capita. Little that is reliable can be found for the year 1830, and so the table begins 1840. The figures are obtained from State records:

YEARS.	Population.	Taxable Values.	Values per Capita.
1830	343,031		
1840	685,866	\$91,756,018	\$134
1850	988,416	137,443,565	139
1860	1,350,428	455,011,378	337
1870	1,680,637	662,283,178	394
1880	1,978,301	787,815,131	394
1890	2,192,404	856,838,472	390
1897	2,867,036	1,292,641,237	451

ACTUAL VALUES.

While the foregoing table shows the values for taxation purposes, which are always much below the facts, the following are the actual valuations of lands, improvements and personal property, as shown by the decennial census returns, and more fairly represent the facts of our progress as a State:

YEARS.	Population.	Actual Values.	Values per Capita.
1850	988,416	\$202,650,264	\$205
1860	1,350,428	528,835,371	392
1870	1,680,637	1,268,180,543	755
1880	1,987,301	1,681,000,000	850
1890	2,192,404	2,095,176,626	956

PERMANENT AND CURRENT SCHOOL FUNDS.

The further progress of the State since 1850 is seen in the rapid increase in the permanent public school fund, which is now invested in 6 per cent. securities and the income only used for current purposes, and in the increase of the current school revenues from the State levy:

YEARS.	Six Per Cent. Invested Fund.		Current School Revenues.	
	Permanent Fund.	Per Capita.	From State Levy.	Per Capita.
1850	\$52,248 08	\$0 66	\$1,041,448 44	\$1 65¼
1890	10,222,792 24	4 57	5,572,124 35	2 54

STATE REVENUES.

As the State proceeded with the construction and expansion of her benevolent institutions, educational and other public enterprises, the demands for larger revenues were manifest, and this is shown in the period of 1850 to 1890, by the following table of State revenues:

YEARS.	State Revenue.	Per \$100 Valuation.
1850	\$1,383,360	\$0 33½
1860	3,701,352	0 90
1870	10,791,121	1 63
1880	11,943,650	1 64
1890	15,584,054	1 82

INTEREST RATE.

A most interesting factor in our progress and development is the trend of the rates of interest in forty years. The current and not the legal rates are here referred to. In 1860 the State had about ended the "wild-cat"

banking period, as it was called, during which it was hard to determine interest rates. And so the table of interest begins with 1860:

YEARS.	Average Interest Rates.
1860	10 per cent.
1870	6.74 per cent.
1880	4.75 per cent.
1890	

Thus it is seen that while aggregate valuations and wealth were rapidly increasing, the interest rate was decreasing, until now the average rate is lower than it ever was before.

RAILWAY CONSTRUCTION AND VALUE.

Soon after the State closed up its disastrous enterprises in the way of public improvements, and railway construction undertaken had fallen into the hands of private capital, these enterprises expanded very rapidly. It was the beginning of a new and most prosperous era in the history of the State, as population and wealth now also rapidly increased. The following table gives the mileage of railway construction, and total values for taxation from 1840 to 1897. The cost of construction and equipment is also given:

YEARS.	Miles.	Taxation Value.	Construction and Equipment.
1840	86	\$1,095,888	\$1,720,000
1850	1,127	22,400,000	33,810,000
1860	2,126		63,780,000
1870	3,177		95,310,000
1880	4,963	38,442,941	148,890,000
1890	7,431	69,762,676	222,930,000
1897	8,606	154,841,971	250,000,000

PROGRESS IN WEALTH.

A summary of the valuations, permanent school fund, annual output from natural resources, and the annual productions of the farms, factories and mills, give the present status of the wealth and progress of the State compared with 1850.

ITEMS OF WEALTH.	1850.	1890.
Annual value of coal, gas, petroleum and stone.	\$508,000	\$16,309,793
Farm and live stock	39,452,555	256,482,089
Annual value of production from cereals, etc.	20,249,760	142,561,846
Annual value of manufactures	18,725,423	226,825,082
Lands, improvements and personal property	202,650,264	2,096,176,626
Permanent school fund.	652,248	10,222,792

While the year 1850 is used in the comparison to show the progress of the State, the greatest occurred between 1865 and 1890. In its mineral development and manufacturing there are yet vast possibilities, and agriculture is but passing its first stages. The two latter features will be treated upon in another bulletin.

AGRICULTURE AND MANUFACTURES.

French explorers found their way to this region in 1702, and seventy years later the white population did not exceed 550 souls, though several Indian tribes had long roamed over the unbroken wilderness. As finally settled upon in the organization of the territory, and finally the State, its greatest length is 276 miles, and the average width about 140 miles, divided as follows:

The land surface, in square miles.	35,910
Water surface, in square miles.	440
Total	36,350

Reducing this area to acres, both of land and water surface, the acreage of the State would be as follows:

Acres in land surface.	22,982,400
Acres in water.	281,600
Total	23,264,000

These seem to be the correct figures as to the square miles and acreage of the State, as shown by the surveys and appraisement for taxable pur-

poses. The census returns, however, differ from this as shown by the decade returns for 1890 as follows:

Acres improved land.....	15,107,482
Acres unimproved	5,255,034
Total	20,362,516

THE BEGINNING OF AGRICULTURE.

The title to land held by the Indians, extinguished prior to 1812, released to white settlement chiefly the hill regions of the State as shown on the physical map, given in Bulletin No. 5. This cession occurred in 1810, and here the agriculture of Indiana with its first titles to the lands began its struggle in subduing the great forests of white and burr oak, walnut, beech and many other varieties of timber, thickly covering the hills and valleys alike. The cabins of the pioneers were built upon the hill-tops, for they reckoned the valleys unhealthy. They were poor and brought with them little more than enough to buy 80 to 160 acres at the government price of entry of \$1.25. Wild game abounded, and with this, and a few years of heroic struggle in the green forests, they were soon able to maintain themselves with the rude spade and plow for implements of cultivation. When the State was admitted to the Union in 1816, a new impetus was given to settlement, and in a year or two thereafter much of the richer lands of the more central and northern sections were relinquished to white settlement, leaving then only small reservations for the Miami and Pottawatomie Indian tribes, in the Mississinewa and Eel River regions. This cession of 1818, called the "New Purchase," opened very large sections of rich lands, mostly heavily timbered, but with small prairies here and there. Now a strong tide of home-seekers set this way from the older States, and the new public land sales opened in October, 1820. It was before the day of speculation, and the purchases were chiefly by actual settlers seeking new homes. The central regions of the State were very heavily timbered with poplar, oak, walnut and other forest timber, and there were dense jungles of undergrowths of various kinds, for it was a moist region, lying high, but level, and possessing only natural drainage, and holding water in numerous natural reservoirs. Here was found a soil, though level and wet, yet possessing great natural fertility, equal to the rich valleys of the hill regions. There was no market for lumber, and the valuable forest timber in the way of cultivation was made into rails for the fences and destroyed by deadening and burning. Like the first settlements in the hill region, the settlers here rarely had more than surplus enough required to carry them through the first year. The future to them meant hard toil for existence, but they

were of stout heart, and, with the abounding wild game, they soon established themselves in rude though fruitful homes.

The first money made by the farmers of Indiana was in growing hogs. The breed was as rough and rude as the country, but the great oak and beech forests afforded the mast upon which they fed and, for the most part, fattened; in these days maturing for market at two years old, instead of in six and eight months as now. The pigs and cows, with a dozen dollars annually from the sale of the surplus, when there was any market at all, enabled the early settler to make ends meet. It was a very primitive kind of farming in Indiana up to about 1830. There was annually added a large area in fields and cultivation, but there was little market for anything. The Ohio, Wabash and smaller rivers afforded ways out to

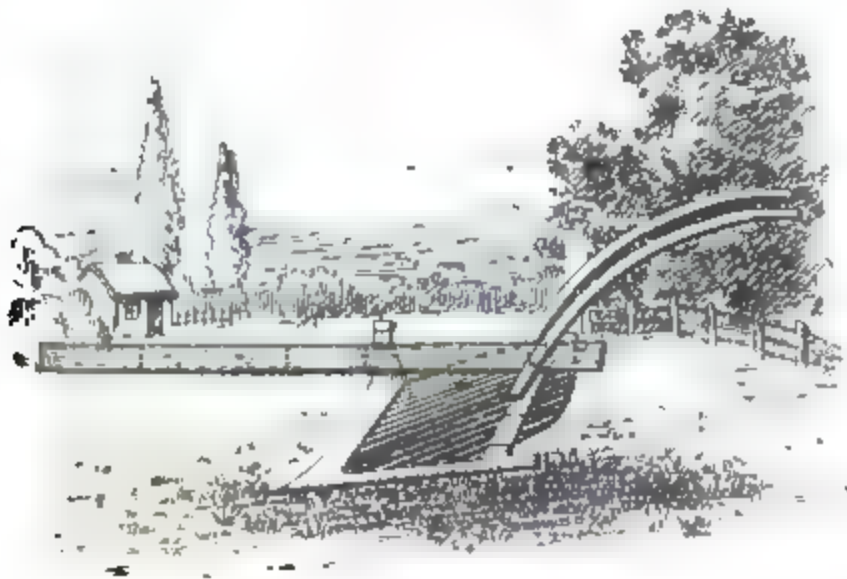


PRIMITIVE WOODEN PLOW.

such markets as there were, by steam and flat boat. Wheat and corn were hauled from the interior to these water-ways and markets, seventy-five and a hundred miles; and wheat, between 1830 and 1840, sold at 30 to 50 cents per bushel, and corn, 10 and 12 cents, delivered over long muddy roads. When the Wabash and Erie Canal was opened in 1841, a new era in agriculture dawned. With this, augmented commercial and manufacturing communities had sprung up, whose consumers made larger demands for the surplus agriculture. This new water way, connecting with the lakes, afforded a line of transportation from the heart of the State to the eastern markets and thence to Europe. This gave a great impulse to the increased growth of the cereals. About this time, also, the railway system began developing. With these improvements building up new communities of consumers, and opening the way to the older ones in the East, diversified agriculture began developing rapidly. The very exclusive hog farming gave way or was supplemented by wider areas in wheat, corn, oats, meadow, etc. Orchards were planted, fruits and vegetables were generally grown, and the privations of pioneer life rapidly gave way to better conditions.

THE FARM IMPLEMENTS.

Previous to 1830 the implements of farm husbandry were rude indeed. Among the first plows used in the State was the bull plow, so named, perhaps, because bulls and oxen were used nearly exclusively to do the plowing; they were slower and steadier than horses, which was important in plowing among the forest roots. The stock or woodwork of these plows was usually crude and rough, made by the farmers themselves who used them. The handles were the butts of bushes, with the best of crooked roots for the turn in the handles, by which they were held in plowing. The beams were hewn with the axe from small, tough oaks. The mould-boards were made from blocks of wood about twenty inches square and three inches thick. The inner and straight side of the mould-boards were fastened to the handle, while the outer surface was hewn out in an irregular troughing shape, much as the present chilled plow is made. The wing of the share extended high up the mould-board, and with it was



CAST IRON PLOW, PATENTED IN THE UNITED STATES, 1797.

bolted the sheath. A loop or iron socket was forged and welded inside of the bar into which the wooden sheath or post rested, and in which the head of the large bolt, or colter, which held down the beam, was fitted. With such a plow, on clean ground in good condition, a man with a good team could break about an acre and a half in a day of twelve to fifteen hours. The wooden mould-board had to be frequently cleaned off with a paddle, constantly carried by a cord on the handle of the plow. It required much more labor than it does now, with the improved plow, to do far better work on two and a half acres per day. About 1840 the improved low-winged plow with cast-iron mould-boards came into use. It was a great improvement over the wooden mould-boards, did far better and more work in a day, had less draft, and was less laborious to man and team. This was succeeded with the steel and with the chilled plow.

In the hill sections of the State, sixty years ago, the plowing was done so as to prevent washing gullies, and so the steep hillsides were plowed along the sides, throwing the furrow down hill, and dragging the plow back to run another furrow in the same way, thus plowing a half acre per day. Now the revolving plow made for hill plowing is quickly reversed to plow either right or left, and hillside plowing is as rapidly done as any other kind.

The V-shaped, wooden-tooth harrow was the first in use for cultivation. These were made usually by farmers themselves. These harrows at the wide part covered four to six feet of ground. The frame receiving the teeth was made heavy enough to press the harrow into the ground and break the clods. The teeth were ten to twelve inches in length, made of some kind of hard wood and sharpened at the point. They were very laborious to handle, and were of heavy draft on the teams, and about one-fourth was accomplished with them in a day that is now done far better



ADJUSTABLE POINT PLOW OF 1819.

with improved harrows. The harrow of these early days for cultivation of crops was supplemented with clumsy, heavy single-shovel plows and hoes. With such implements for cultivation four men then did about the work of one now. In these days of soil scratching merely with the plow and rude cultivation, the saving feature of agriculture was the new and virgin quality of the soil. Natural fertility of soil was fairly productive in spite of poor culture. With such cultivation now it would be quite impossible to produce anything of value. But with improved implements and the proper use of fertilizers, average production per acre is steadily increasing.

Sixty years ago the sickle, or reaping hook, was used nearly exclusively in harvesting the wheat and other cereals. It would astonish the farmer of to-day to see the gymnastic evolutions of the bands of expert harvesters going into the standing grain fields. Reaping grain with the sickle was something one had to learn, to be at all expert at it and ca-

pable of cutting a half to three-quarters of an acre per day. Each man cut three and a half to four feet in width for his swath. The first movement was to cast the sickle into the standing grain, compelling it to lean somewhat towards the reaper, and then dexterously throwing forward the left leg, the grain was further led into the desired position, then by throwing around it the right leg and the left arm and hand, it was in position to be cut off by the sickle, ten or twelve inches above the ground, and dropped from the left hand of the reaper into piles. On the return, to rest his back, the reaper, carrying his sickle on his shoulder, properly twisted into his suspender so as to hold it there, he bound into sheaves the grain he had cut through the field, and started in again. Usually from five to ten persons composed these bands of reapers, one man following another, and their gyratory movements at cutting a half acre each per day would



PRIMITIVE BRUSH HARROW.

be a sight to the driver of the present stately harvester, as, with two horses, he rides, cuts and binds twelve acres of grain per day with ease.

In early days these bands of reapers with their sickles, composed of a dozen or two young, stalwart men, together would begin their work in the south part of the State, where the wheat first ripened, and reap the fields northward, thus catching on to the maturing fields as they ripened. The best reapers were paid $37\frac{1}{2}$ cents per day, or a bushel of wheat, then reckoned an equivalent. About 1840 the grain cradle came into general use, except in the fallen grain, where the sickle was still used. The grain cradle was a great improvement over the sickle, both as respects the labor and celerity in using it. A good cradler and two binders could harvest and shock about three acres per day.

Previous to 1840 the grain was threshed either with the flail, or was tramped out with horses. Two men could flail out and winnow about twelve bushels per day, and two men and a boy, with horses, could tramp out and winnow about twenty bushels a day. The winnowing, or sepa-

rating the grain from the chaff, was done by the hand sieve, pouring the mixed chaff and grain from above, two men at the ends of a bed sheet so vibrated it as to make a current of air which blew the chaff to one side while the heavier grain fell in a pile at their feet. The first threshing machine was introduced into the southeastern part of the State in 1839. With four horses and eight or nine men, two hundred bushels of wheat could be threshed, though it required cleaning afterward, as the threshing machine did not clean it then. It required three men two days to clean and sack what could be threshed in one. This was thought a wonderful improvement over the old way of doing this work. But so greatly has improved machinery followed, that now the same number of persons with the steam power thresher will thresh, clean and sack one thousand bushels of wheat per day. And so might be mentioned the old method of broadcast wheat and oats seeding, harrowing or brushing in of the grain among the clods, and the other clumsy implements and methods of grain farming in the early days. The scythe fifty years ago was used exclusively in mowing the meadows. A good strong man could cut one to two acres of hay per day. The hand rake was then wholly in use to rake up the hay preparatory to stacking with the wooden fork. With the mowing machines of to-day a man cuts ten acres of meadow in a day; and with a steel-tooth sulky horse-rake another easily prepares it for the stack or mow, and a steel fork handled by a man and a horse does the rest. The first hay press in use was made of a long wooden screw about a foot in diameter, with ten to twelve feet in length of thread to the screw. A stick of timber twenty-six inches square with a hole through the center served as a nut, with threads cut to receive the wooden screw. The nut was framed into the top of two great posts twenty-six by eighteen inches in size and twenty-one feet long, standing four and a half feet apart, and six feet of these posts were planted into the ground. A space eleven feet in height was left to receive the hay to be pressed. The sides were closed strongly to the furrowed posts. To the top of the great wooden screw were fastened thirty-four sweeps bent downward, to which horses were hitched. Thus the horses traveled over a mile and a half to turn the screw down to a finished bale of hay, two feet square and three to four feet long. And so our fathers pressed and baled hay at the rate of two tons per day with three men and two horses. Now, with the improved hay press, which costs less, the same labor and time is required to press and bale six or eight tons.

NEW IMPETUS TO AGRICULTURE.

These details are mentioned in order to enable the present generation to compare their conveniences, improved implements and methods with those of the past years of pioneer life. Considering increased population and increased demand, it is readily seen that the improved implements of

husbandry and machinery of production did not come sooner than they were needed. With the rude tools of agriculture the prices of farm products were only about half what they are now, thus showing the trend of supply and demand under increasing population and higher conditions of citizenship. A great impetus was given to agriculture about 1850, the beginning of rapid railway construction. The first lines in the State were projected and partly built fifteen years earlier. The building of these roads had a wonderfully stimulating effect on agriculture. Previous to this there was little or no rotation of crops. Year after year the same fields were grown in wheat or corn. Now occurred a wider demand and greater variety, and crop rotation began. The farm needed the railway and the railway required the products of the farm to be profitable. Here was a rich level country of over two hundred miles, lying between the hill sections of the Ohio River and the Great Lakes on the north. These phys-



PATENT ROTARY HARROW, 1859.

cal reasons marked the State as the way of all the great transcontinental lines. It was also in the midst of the belt for the production of the staple bread stuffs of the world. And so over the central and northern sections were built what have become the great railway systems which traverse the continent. These were first constructed as separate lines, and it required many changes and reshipments, and weeks of time to reach the seaboard with the products by rail even, at first. Agriculture received its next large benefits from railroads when the consolidations of these numerous lines were effected. That step reduced freight one-half, and the time required to get to market more than one-half. Whereas it cost the price of a bushel of wheat to take three to market, now it costs less to freight a barrel of flour from Indiana to New York than is required to haul it across that city. The numerous railway lines traversing the State touch all but three of the ninety-two counties, and the system embraces about 6,000

miles within its borders. Nothing that has occurred in the history of Indiana has given a greater impetus to agriculture than railway building. They opened the way for the mills and factories of every kind, and established new markets for the farm surplus near home. And so one great industry gave impetus to another, till now we have a community almost symmetrical in all the essentials necessary to the prosperity of all.

THE SOILS OF INDIANA.

The summit lands lying at the top of the water sheds are underlaid with a heavy clay. Usually the vegetable accumulation forming the top soil is not deep, but with proper cultivation, drainage and fertilization, are



THE PIONEER HAND PLANTER.

very durable and productive in the growth of meadows and the cereals. This soil is greatly improved by deep plowing and tile drainage to admit the air, and in some localities by a lime dressing, where limestone is absent. The native soils of the beech and oak flats are quite light in color, and for a few years in cultivation were comparatively productive, but were rapidly exhausted. With drainage and proper fertilization these soils are again becoming more productive than ever, and they now grow as fine grain and hay crops as most others. The summit, wet, muck soils, with their years of decaying vegetation, once shunned as worthless, have been reclaimed by drainage and are proving themselves among the very best for nearly all purposes of production.

The undulating uplands, either formerly timbered or prairie, are very

much alike. They are both sandy loams, decayed vegetation appearing considerably greater in the prairie soils, which have a darker color. These lands have a loamy clay subsoil, which retains moisture well and are much benefited by tile drainage, which admits the air. Much of the fertility of these undulating lands and soils is retained by tile drainage. The surface water in times of rain sinks through percolations to the tile, leaving the vegetable loam in the soil, whereas with only open surface drains it is washed off and lost. These soils are very easily plowed and cultivated, and with about 60 per cent. of fine sand do not bake and become so cloddy as the clay lands. They produce the cereals well, make the best of pasture lands, and blue grass especially flourishes on them. None of our soils produce better crops of wheat than these, and they are very durable, the subsoils usually abounding with the elements of mineral



PATENT WHEELBARROW PLANTER OF 1875.

fertility to several feet in depth. When tile drained properly these soils are the very best for orchards and all kinds of fruit growing.

The numerous valleys and bottom lands along the many rivers and water courses afford a large area of alluvial soils. These are made up largely from the rich washings of the hills and undulating lands, before tile drainage became so general. The soils rest usually on beds of gravel and sand, several feet beneath them. The annual overflow of these lands in the early spring season keeps up great fertility. Great crops of corn are annually grown upon these alluvial soils, yielding seventy to eighty bushels to the acre. After they are cultivated several years in corn they produce fine wheat, oats and other small grain crops, but when new these grow too rank and fall badly. These valley lands are generally skirted

with what is called second bottom lands, which are frequently much wider in extent, lying higher and with rich, sandy loams upon clay subsoils. These lands are very productive in the growth of wheat, oats, timothy meadow and many other crops.

The prairie soils of the State lie in the northern and northwestern sections chiefly. They are underlaid with a heavy clay subsoil, and no lands are improved more by tile draining. These soils are rich in vegetable matter, and contain a very considerable per cent. of fine sand. They are exceedingly productive, producing better corn than any others, unless it is the alluvial first bottom lands. After they are well subdued, wheat, oats, timothy meadows, clover, blue grass and almost any other crop flourishes upon them.

The central southern tier or two of counties bordering on the Ohio River have a soil peculiar to no other section of the State. The soils here are chiefly made from the rocks by the influence and attrition of the



A PRIMITIVE CULTIVATOR.

natural forces of frost and water, which in centuries have disintegrated the rocks and combined such vegetable matter as came in contact. In late years with the free use of bone dust and other fertilizers they have become very productive in wheat growing. They produce peaches and other fruits in abundance when there are none grown in other sections of the State. Some of the counties along the Ohio River have become great peach growing districts, the crop rarely ever failing on any account. These lands, formerly thought to be worn and nearly worthless, have lately become productive and very valuable. Many of the soils here rest upon sub carboniferous limestone, while others are Devonian shale and limestone.

Thus it is seen that the State abounds in soil variety. With proper subduing and reclamation by tile drainage, and the use of fertilizers, rotation of crops and intelligent tillage, it has been found that they all improve in productiveness.

LEADING AGRICULTURAL PRODUCTIONS FOR SIXTY YEARS.

YEARS.	Bushels Wheat.	Bushels Corn.	Bushels Oats.	Tons Hay.	Pounds Wool.
1840	4,019,375	29,155,887	5,941,605	178,029	1,237,919
1850	6,213,458	52,964,463	5,855,014	403,230	2,610,287
1860	16,418,267	71,588,919	5,317,631	622,428	2,552,318
1870	27,747,222	51,094,538	8,590,409	1,056,768	5,029,023
1880	47,284,853	115,482,300	15,599,518	1,361,083	6,167,498
1890	37,318,798	108,843,094	31,491,661	2,741,045	4,863,404

The largest crop of wheat ever grown in the State was that of 1891, when the total yield was something over 52,000,000 bushels on a little less than 3,000,000 acres, an average of a little over seventeen bushels per acre.

GROWTH OF THE LIVE STOCK INDUSTRY.

In the early settlement of the State there was little of this industry. The ox was esteemed for farm work, and a good yoke of cattle sold for



THE STRADDLE ROW CULTIVATOR OF 1835.

\$25 to \$35. Beef cattle weighed 600 to 700 pounds, and were reckoned extra when at five or six years old could be fattened to weigh 1,000. In those times the prices were considered fair if beef cattle sold at one and a half cents a pound. Growing hogs was pursued more generally and was more profitable. The breeds were indifferent also. They required two years or more to mature, and then rarely weighed more than 175 to 200 pounds. In 1840 the packers' standard of weight at Lawrenceburg and Cincinnati was 200 pounds, and from 1840 to the end of 1843 the average price did not reach quite two cents per pound gross. Milch cows sold for \$7 to

\$8, and were thought good if they produced three pounds of butter a week, which then sold at six cents per pound. Horses were also of very indifferent breeding, and were held merely as a necessary animal in farm economy, and those who were able to have them in preference to oxen for this purpose were reckoned somewhat aristocratic. Horses sold for \$30 to \$40 each. A few sheep were also kept of the mongrel breeds, for wool was a necessity for clothing. The wool was carded by hand, made into yarn on the hand spinning wheel, and woven into jeans and linsey on the hand looms found on almost every well-ordered farm. This was one



THE COLONIAL REAPER.

of the early necessary industries, for there was little machinery in the country then to produce the clothing of the people

Shorthorn cattle of the pure breeds were the first introduced into the State, and to this great breed is due the rapid advance to the front rank, which distinction Indiana has long enjoyed. The first introduction of these cattle in the State was in 1825 by Mr. Edward Talbott, near Madison, Jefferson County. This was followed by Mr. John Owens in 1828, in Monroe County. The first public exhibit of this breed of cattle was made at the Marion County Fair, held in the old "Governor's Circle," now Mon-

ument Place, the center of Indianapolis, in 1835. In the following ten years these pure bred cattle were brought into several other counties of the State. The first volume of the Herd Book, published in 1846, did not contain a single pedigree of Indiana cattle, so little attention was then paid to the importance of records of pure breeding. The next volume, published in 1855, had the pedigrees of thirty-five Indiana breeders of these cattle, representing nineteen counties and something over 137 cattle. From this date Shorthorn cattle were sought for in every section of the State, and the importations from England have been numerous. This great breed soon raised the average weight of cattle throughout the State of from 700 to 900 pounds up to 1,400 and 1,600. Not only so, but it was soon found that grade Shorthorn cattle could be matured at about half the age required by common breeds.

The introduction of other pure breeds are of comparatively recent date. Of the other beef breeds may be mentioned the fine herds of Herefords, Polled Angus, Red Polls and Galloways. Of the improved dairy breeds are the Jerseys, Holstein-Friesians and Devons.

In trotting, coach and draft horses, the State stands among the first. Especially is this true of trotting and pacing horses. The standard bred horses of Indiana have a wide reputation, and the blood and breeding are carefully maintained by the associations having these matters in their charge.

Sheep husbandry is most intelligently pursued in every part of the State, the Shropshires, Merinos and South Downs predominating, though there are many flocks of other pure breeds.

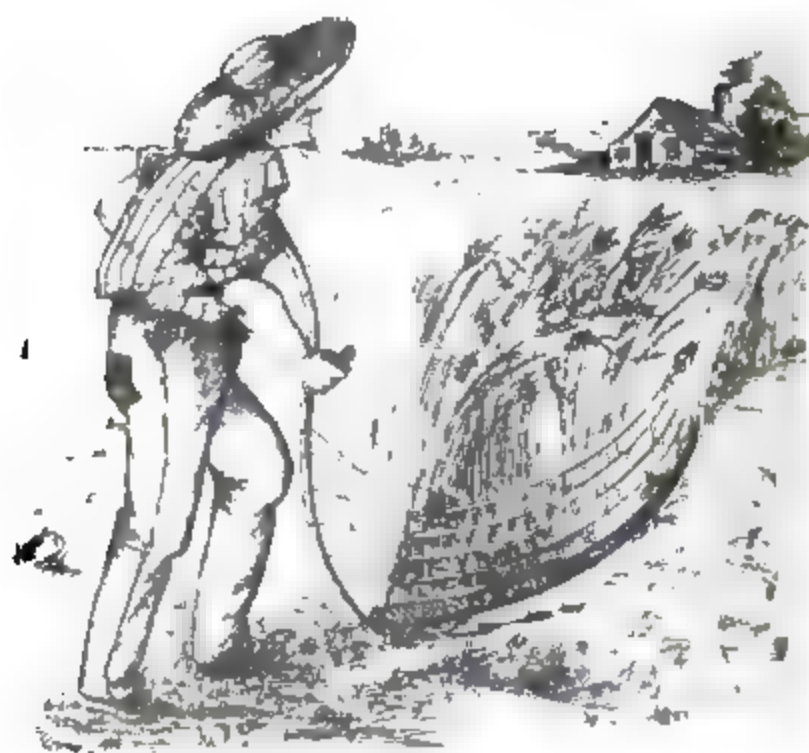
Swine herds are numerous, and this line of live stock breeding has been brought more nearly to perfection than any other. The last of the common breeds of swine were abandoned years ago. Poland Chinas, Berkshires and Chester Whites are the leading breeds, and in about the order named.

LIVE STOCK FOR SIXTY YEARS.

YEARS.	Number Horses.	Number Cattle.	Number Sheep.	Number Hogs.
1840	241,036	619,980	675,982	1,623,608
1850	314,299	714,666	1,122,493	2,263,776
1860	520,677	1,069,344	991,175	3,099,110
1870	497,863	1,026,184	1,612,680	1,872,230
1880	581,444	1,363,760	1,100,511	3,186,413
1890	720,035	1,511,908	1,081,133	3,320,817

THE MANUFACTURING INDUSTRY.

This industry began with development of our railway system in 1850. Prior to that date there were a few small mills and factories at leading centers of population, but much of the manufacturing for home use was done at the farm houses. The domestic spinning wheel and loom were to be found in every home, and the shoemaker was an itinerant—more skilled than his fellows, he had his circuit and went from house to house with his small kit of tools, making and mending shoes. These things were especially true of the country, while the people of the larger towns indulged



THE GRAIN CRADLE REAPER.

In factory made imported goods at prices five or six times that now paid for such articles. The carding machine was gradually added, by water and steam power, and soon superseded the hand-carding of the domestic clothing wool. Then the power spinning machine in simple form displaced the distaff and the hand spinning-wheels, and this was followed by the power loom for weaving the clothing fabrics, and the fuller's machine for improving the cloth, and the homes of the toiling begin to put on a new aspect. In the field work, the tree-top brush harrow and the wooden-tooth harrow in 1820 began giving away to iron-tooth harrows, and the wooden mould-board plows to cast iron. The reaping hook and grain cradle remained in the harvest field much longer, and the same is true of the crude methods of both threshing and winnowing the grain. But popula-

tion began growing rapidly, and if the people were to be fed and clothed there had to be advanced methods of production and domestic economy. Inventive genius showed itself equal to the task, and the splendid machinery of the factory and farm came in due time. Only the crude implements of pioneer life have been shown by illustrations of these things. The field, factory and mine are abundant in improved implements, and the people are familiar with all this.

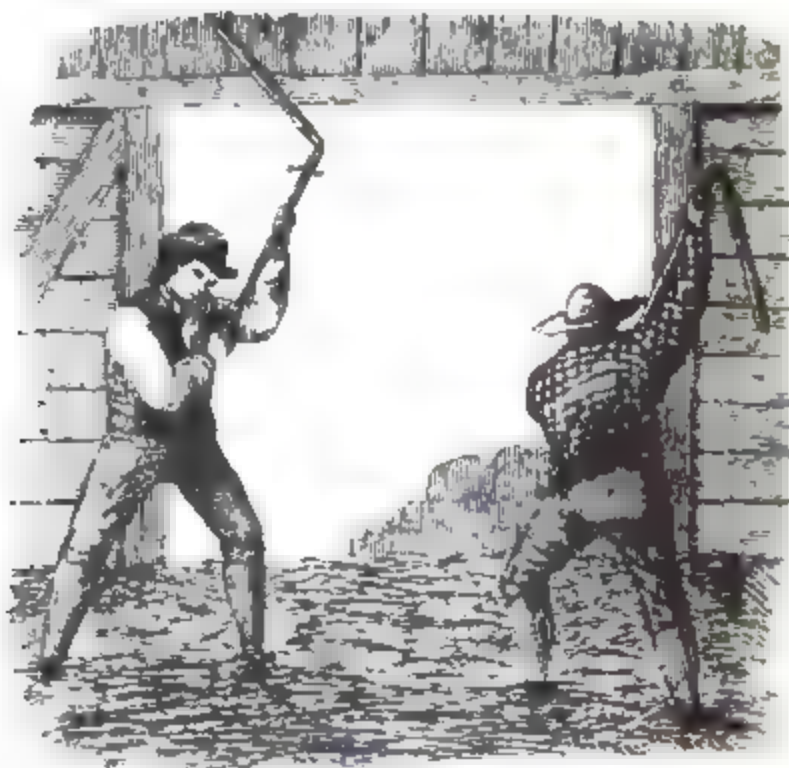


THE REAPER OF 1835.

Indiana began its factory system proper about 1840. The subsequent extension of the railway system for transportation, the building of mills for utilizing the forest timber, the discovery of great coal and clay fields, and finally the wonderful impetus given manufacturing by its extensive field of natural gas, have greatly developed this industry. Taking the decennial periods beginning with 1840 we find the following rapid increase in capital invested, people employed, and value of products:

YEARS.	Capital Invested.	Number Employed.	Value of Products.
1840	\$1,132,043	7,140	
1850	7,750,401	14,440	\$18,725,423
1860	18,451,721	21,296	42,801,469
1870	52,052,425	58,852	108,817,278
1880	65,742,982	69,508	148,008,411
1890	131,605,366	124,349	226,825,082

YEARS.	No. Establish- ments.	Cost of Materials.	Wages Paid.
1850	4,392	\$10,369,700	\$3,723,344
1860	6,323	27,142,597	6,318,335
1870	11,847	63,135,492	18,366,780
1880	11,198	100,282,917	21,960,888
1890	12,354	130,119,106	51,749,976



THE PIONEER HAND FLAIL FOR THRESHING GRAIN.

It was between 1880 and 1890 that our natural gas field stimulated the manufacturing industry, increasing the products from a little over \$148,000,000 to over \$226,000,000. It is believed that a complete census now of our manufacturing industries, which the Bureau is unable to take for want of adequate appropriation, would show an increase of nearly or quite thirty per cent. of these largest figures. The largest per cent. of this great increase has occurred during the last eight years in the natural gas belt.



THE GRAIN THRESHING FLOOR.

Indiana Agriculture for 1899.

COMPILED BY

JOHN B. CONNER,

Chief of Indiana Bureau of Statistics.

AGRICULTURE FOR 1899.

In many respects the year has been a fruitful one for the agricultural industry, excepting that of wheat growing in many counties of the northern section of the State. From January to April there was little or no snow protection of the plant, and much of the period with the mercury far below zero. Wheat, nevertheless, promised well until the latter part of March and early April, when freezing and thawing, added to the weakened condition of the plant, almost destroyed its vitality in many sections so long without snow protection.

The reports to the Bureau on acreage are made by the assessors of 1,014 townships, and the yield was estimated and reported by the township trustees in October, and by threshermen as to yield of wheat, oats, etc.

THE WHEAT CROP.

The average area of wheat sown for the State falls a little below 3,000,000 acres, but in the fall of 1898 3,437,577 acres were sown to wheat, which was very much above the average for the State. As a result of the hard winter on the plant there were 397,644 acres plowed up and put to other crops in the spring of 1899. This occurred chiefly in northern counties of the State, as already stated. The remainder of the area was well above the average, being 3,039,933 acres. It should be said, however, that a considerable of this remainder was so thin on the ground at harvest as to not warrant harvesting, though it was left standing because grass seed was growing in it and it was desired to preserve the coming crops

of timothy and clover. A large part of the acreage plowed up is shown in the following counties:

	Acres.
Allen County	31,228
Huntington County	22,694
Tippecanoe County	24,913
Fountain County	21,589
Wabash County	21,261
Vermillion County	17,831
Montgomery County	15,335
Boone County	12,541
Clinton County	12,825
Kosciusko County	11,228
Whitley County	10,131
Laporte County	10,494
Dekalb County	9,716
White County	9,042

In many other counties the area plowed up and put to other crops varied from 2,000 to 8,000 acres, and it will be noticed by the counties named that the largest damage to the plant was done in the northern section of the State.

In the table given by counties it will be noticed that the total yield of wheat in the State is put at 31,357,099 bushels. Notwithstanding the large acreage left for harvest, this is much below an average crop of wheat for the State.

In the column of average yield by counties it will be noticed that in many it is given at four to seven and eight bushels per acre. There are forty-two counties reporting a yield below ten bushels per acre, while there are a considerable number in the central and southern sections of the State which report the yield at fifteen bushels per acre and upward. It may be said of the wheat crop that the quality grades well, though the grading does not compensate for the short yield.

THE CORN CROP.

The table of area by counties gives the corn crop of the year at 3,837,959 acres, which, while not quite as large as in a former year, is somewhat above the average for the State. The yield shown in the same table is the largest ever reported, being 151,246,804 bushels. This is the largest corn crop ever reported for the State, and the reports are in general concurrence that the crop is a more nearly merchantable one than in several former years. It will be seen that the average production by counties is very high in nearly all sections of the State. The smallest average yield in any county is reported at twenty-six and one-half bushels per acre, while the largest yield is reported at fifty-six bushels per acre,

that of Tipton County, which, years ago, before surface and tile drainage became general, was reckoned a poor county in agriculture, but which drainage has made one of the most productive in the State in this great cereal. The same is true of many other counties in the level plateau of the State which lay high, and many years ago were reckoned too wet for profitable agriculture. The reports on yield of corn, as well as on that of other productions, have been verified by the Bureau in many ways, and in some instances toned down in the regular reports. Altogether the corn production of Indiana is the greatest in the history of the State. The aggregate yield ranges from 5,266,614 bushels in Warren County down to 279,356 bushels in Floyd County, but it should be said that Floyd County had a small area to corn and is never reckoned a great corn county, though its average yield is above thirty-three bushels per acre.

OATS CROP.

While the area was a little below the average, the crop is one of the largest and best in quality for several years past. The area was not quite one million acres, but the yield was 36,801,186 bushels. Laporte County leads in the production with over 3,700,000 bushels, followed by Benton County, with over 2,400,000; Allen County, with over 2,200,000; Newton County, with over 1,900,000; Jasper County, with over 1,300,000; Warren County, with over 1,100,000, and Lake County, with over 1,000,000 bushels. Wells County leads in the yield per acre, being $46\frac{1}{2}$ bushels, followed by Allen with $43\frac{1}{2}$ bushels; Newton County, with $40\frac{1}{2}$ bushels, and Huntington County, with 40 bushels per acre. In the table by counties, it will be noticed that the yield stands unusually high for the whole State.

TIMOTHY AND CLOVER.

The area in timothy was a little below the average, while the yield being 1,599,976 tons is a little above the average for the past ten years.

The area in clover was about the usual average, while the yield was considerably above the average for the past ten years, being 2,091,534 tons.

LIVE STOCK.

The number of horses on hand was 614,303; died during the past year, 20,255.

The number of mules on hand was 48,956; died during the past year, 1,749.

The total number of cattle in the State was 1,158,158, and of these 492,680 were milk cows. During the past year 19,427 cattle died.

Hogs on hand for the year were 1,756,476; died during the past year, 553,930. Pigs on hand under three months old on April 1 were 1,145,936.

On April 1 there were 861,024 sheep and 459,097 lambs. The wool

clipped for 1899 was 4,631,477 pounds. Sheep killed by dogs during the past year, 15,727. Sheep affected by scab were 9,719. Sheep died during the past year, 55,284. The value of all domestic animals slaughtered on the farm was \$4,795,639.

DAIRY AND POULTRY.

Gallons of milk produced in the State, 144,533,666. Pounds of butter, 31,905,140. Pounds of cheese made on the farm, 1,083,403.

Poultry of all kinds on farm, 1,241,702 dozens, and eggs produced, 39,069,760 dozens.

FARM AND DOMESTIC LABOR.

The number of farm hands regularly employed was 33,404, and the average wages, including board for farm hands, was \$13.89 per month. Number of women employed in families on the farm was 11,714, and their average pay per week, including board, was \$1.56. The table referring to these things will be found interesting as given by counties.

SUMMARY FOR THE YEAR 1899.

The leading products of the farm, and their value for the year, taking the current prices at Indianapolis, and including the live stock on hand, are as follows:

PRODUCTS.	Quantity.	Value.
Wheat	31,357,099	\$11,014,256
Corn	151,246,904	45,374,041
Oats	36,801,186	9,300,296
Rye	499,112	299,450
Barley and buckwheat	815,976	157,988
Timothy and clover hay	3,691,531	40,600,830
Flaxseed	8,486	13,880
Irish and sweet potatoes	5,577,237	3,255,340
Sorghum	791,135	245,350
Wool clip	4,631,477	1,140,400
Tobacco	11,891,464	590,400
Turn grasses		6,500,000
Milk, butter and cheese		17,180,000
Poultry and eggs		6,980,000
Slaughtered animals on farm		4,795,639
Fruit and garden products, estimated		9,840,000
Honey		680,000
Total		\$167,967,870
DOMESTIC ANIMALS.		
Milk cows	492,680	15,210,000
Other cattle	665,478	19,964,340
Sheep and lambs	1,320,121	4,680,600
Swine and pigs	2,902,432	20,210,124
Horses and mules	663,259	25,120,100
Grand total		\$253,153,034

WHEAT AND CORN.

Area and Production for 1899.

COUNTIES.	Wheat, 1899.			Corn, 1899.		
	Acres.	Bushels.	Yield per Acre.	Acres.	Bushels.	Yield per Acre.
Adams	22,105	265,260	12	32,400	1,360,800	42
Allen	21,442	107,210	5	55,409	2,092,086	54
Bartholomew	54,932	700,383	12½	46,636	1,562,303	33½
Benton				96,405	3,856,200	40
Blackford	11,268	174,654	15½	16,661	666,440	40
Boone	45,504	273,024	6	63,080	3,154,000	50
Brown	12,714	114,426	9	13,999	384,372	27½
Carroll	48,567	412,820	8½	85,172	4,359,072	51
Cass	45,025	170,100	4	47,715	453,393	39½
Clark	23,145	254,595	11	24,466	672,815	27½
Clay	23,258	255,838	11	34,301	1,269,137	37
Clinton	44,174	265,044	6	62,184	3,015,924	48½
Crawford	15,383	111,527	7¼	15,709	439,852	28
Daviess	50,573	455,157	9	77,457	2,591,910	33½
Dearborn	26,814	335,175	12½	16,953	580,640	34½
Decatur	42,100	610,500	14½	42,237	1,499,414	35½
Dekalb	25,892	233,028	9	27,175	1,345,163	49½
Delaware	36,724	661,032	18	43,785	2,111,680	48
Dubois	49,652	608,237	12¼	24,280	752,680	31
Elkhart	51,662	413,296	8	32,397	1,133,895	35
Fayette	26,765	408,166	15¼	22,749	784,840	34½
Floyd	7,548	81,141	10¾	8,339	279,356	33½
Fountain	20,618	87,627	4¼	45,252	1,911,895	42½
Franklin	37,924	530,936	14	28,001	959,034	34½
Fulton	31,222	119,583	3¼	36,285	1,396,973	38½
Gibson	78,663	865,293	11	56,418	2,200,302	39
Grant	33,689	294,879	8¾	50,990	2,243,560	44
Greene	30,077	218,058	7¼	39,024	1,092,672	28
Hamilton	47,424	414,960	8¾	55,842	2,794,377	48½
Hancock	42,381	699,287	16½	44,087	1,939,828	44
Harrison	47,349	497,165	10½	30,705	859,740	28
Hendricks	42,240	549,120	13	49,053	2,060,326	42
Henry	47,771	716,565	15	49,127	2,063,334	42
Howard	44,461	511,402	11½	45,150	2,370,375	52½
Huntington	16,400	665,600	4	42,607	1,853,405	43½
Jackson	48,028	720,420	15	37,628	1,335,794	35½
Jasper	1,718	22,334	13	61,880	2,389,560	37
Jay	32,530	569,775	17½	43,698	1,529,430	35
Jefferson	24,577	36,866	10½	26,991	742,253	27½
Jennings	19,498	238,851	12½	26,194	772,723	29½

COUNTIES.	Wheat, 1899.			Corn, 1899.		
	Acres.	Bushels.	Yield per Acre.	Acres.	Bushels.	Yield per Acre.
Johnson	77,144	1,080,016	14	90,343	4,065,435	45
Knox	77,746	738,587	9½	65,175	2,704,763	41½
Kosciusko	46,826	257,543	5½	42,525	1,786,050	42
Lagrange	42,508	297,556	7	29,330	1,143,870	39
Lake	579	10,711	18½	36,257	1,341,509	37
Laporte	44,748	223,740	5	44,460	1,444,950	32½
Lawrence	16,430	188,945	11½	23,906	681,321	28½
Madison	51,878	726,292	14	57,660	2,738,900	47½
Marion	56,087	869,249	15½	46,771	1,894,226	40½
Marshall	46,196	323,372	7	36,398	1,346,726	37
Martin	15,409	123,272	8	17,527	648,499	37
Miami	37,625	225,750	6	43,371	2,038,137	47
Monroe	14,825	140,838	9½	18,540	509,850	27½
Montgomery	42,674	170,696	4	72,368	3,944,056	54½
Morgan	32,225	483,375	15	49,615	1,835,755	37
Newton	367	5,505	15	61,716	2,777,220	45
Noble	44,247	287,606	6½	29,541	1,358,886	46
Ohio	9,272	92,720	10	5,832	215,784	37
Orange	17,641	167,590	9½	25,363	722,846	28½
Owen	15,572	140,148	9	19,500	555,750	28½
Parke	33,608	117,628	3½	42,809	1,476,910	34½
Perry	24,141	165,551	11	19,818	673,812	34
Pike	31,224	343,464	11	24,644	825,574	33½
Porter	10,639	53,194	5	32,427	1,313,294	40½
Posey	69,483	833,796	12	41,985	1,805,355	43
Pulaski	16,735	125,513	7½	39,783	1,432,188	36
Putnam	32,019	320,190	10	44,777	1,500,020	33½
Randolph	47,154	801,618	17	59,692	2,178,758	36½
Ripley	32,780	409,750	12½	32,384	955,428	29½
Rush	57,595	1,065,508	18½	56,829	2,358,404	41½
Scott	13,676	20,514	10½	15,029	518,500	34½
Shelby	69,923	804,230	11½	69,182	2,594,325	37½
Spencer	62,291	654,055	10½	35,631	1,318,347	37
Starke	4,926	24,630	5	19,192	777,276	40½
Steuben	30,647	291,147	9½	21,426	803,475	37½
St. Joseph	55,054	357,851	6½	34,314	1,166,676	34
Sullivan	37,623	338,607	9	46,146	1,222,869	26½
Switzerland	17,708	194,788	11	15,810	569,160	36
Tippecanoe	28,249	141,245	5	95,339	4,576,272	48
Tipton	24,558	257,859	10½	37,867	1,620,552	56
Union	22,231	366,812	16½	18,238	665,687	36½
Vanderburgh	37,409	505,222	13½	23,769	820,030	34½
Vermillion	10,168	40,672	4	33,007	1,204,756	36½
Vigo	31,043	310,430	10	41,563	1,101,420	26½
Wabash	16,879	168,790	10	42,362	1,948,652	46
Warren	8,912	57,928	6½	128,454	5,236,614	41
Warrick	55,741	445,928	8	33,633	992,174	29½
Washington	36,341	417,922	11½	14,862	349,257	23½
Wayne	46,642	722,951	15½	47,850	1,866,150	39
Wells	23,544	211,896	9	42,424	1,909,080	45
White	12,520	62,600	5	119,502	4,541,076	38
Whitley	16,644	99,864	6	32,272	1,355,424	42
Total	3,039,933	31,357,099	.....	3,837,959	151,246,804	.....

OATS AND RYE.

Area and Production for 1899.

COUNTIES.	Oats, 1899.			Rye, 1899.		
	Acres.	Bushels.	Yield per Acre.	Acres.	Bushels.	Yield per Acre.
Adams	16,412	541,596	33	190	2,280	12
Allen	51,463	2,288,640	43½	394	8,471	21½
Bartholomew	4,919	147,570	30	255	.....	.....
Benton	65,920	2,472,000	37½	10	.....	.....
Blackford	2,648	70,172	26½	449	5,388	12
Boone	4,020	124,620	31	220	2,200	10
Brown	2,550	61,200	24	54	540	10
Carroll	4,480	157,920	35¼	79	790	10
Cass	7,130	242,420	34	112	1,816	16½
Clark	2,882	67,727	23½	120	1,350	11¼
Clay	11,376	329,904	29	175	1,575	9
Clinton	9,285	204,263	32½	373	8,020	21½
Crawford	4,584	92,826	20¼	11	88	8
Daviess	10,866	230,052	22	198	1,584	8
Dearborn	3,767	84,738	22½	403	6,247	15½
Decatur	2,487	77,067	31	24	240	10
Dekalb	21,020	782,965	37¼	317	5,865	18½
Delaware	4,161	128,991	31	488	8,784	18
Dubois	10,848	314,592	29	42	819	19½
Elkhart	12,104	405,484	33½	2,074	21,777	10½
Fayette	1,245	41,085	33	27	594	12
Floyd	1,913	47,825	25	154	2,156	14
Fountain	21,450	750,750	35	115	1,150	10
Franklin	4,337	125,773	29	331	5,627	17
Fulton	8,877	284,064	32	217	2,170	10
Gibson	3,558	92,508	26	152	2,052	13½
Grant	7,440	256,680	34½	322	3,059	9½
Green	8,202	225,555	27½	209	2,404	11½
Hamilton	4,191	96,393	23	116	1,392	12
Hancock	4,016	120,480	30	291	2,910	10
Harrison	6,631	169,090	25½	349	4,188	12
Hendricks	3,520	126,720	36	52	728	14
Henry	2,867	88,877	31	199	4,975	25
Howard	2,054	80,106	39	61	610	10
Huntington	22,820	912,800	40	193	2,509	13
Jackson	12,499	356,221	28½	261	2,871	11
Jasper	42,179	1,391,907	33	1,808	31,640	17½
Jay	18,463	507,732	27½	727	10,906	15
Jefferson	2,202	58,701	26½	113	932	8¼
Jennings	3,007	84,196	28	88	1,144	13

COUNTIES.	Oats, 1899.			Rye, 1899.		
	Acres.	Bushels.	Yield per Acre.	Acres.	Bushels.	Yield per Acre.
Johnson	1,376	42,656	31	10	.....	.....
Knox	5,106	181,263	35½	138	2,208	16
Kosciusko	12,637	467,569	37	1,017	18,306	18
Lagrange	6,275	210,213	33½	1,189	20,808	17½
Lake	27,441	1,070,199	39	1,424	24,920	17½
Laporte	17,646	3,700,566	21	1,472	26,168	19
Lawrence	10,345	268,970	26	389	.....	.....
Madison	4,326	151,410	35	468	7,488	16
Marion	5,572	186,662	33½	296	3,552	12
Marshall	13,412	415,772	31	552	8,832	16
Martin	6,847	164,308	24	61	732	12
Miami	6,002	180,060	30	205	3,792	18½
Monroe	5,061	129,055	25½	21	189	9
Montgomery	7,093	255,610	36½	239	4,780	20
Morgan	2,534	102,627	33	79	1,264	16
Newton	48,128	1,949,184	40½	877	10,962	12½
Noble	11,996	399,770	32½	166	2,407	14½
Ohio	262	5,633	21½	232	2,088	9
Orange	11,465	349,683	30½	81	.....	.....
Owen	6,032	156,832	26	81	851	10½
Parke	6,588	233,874	35½	269	2,690	10
Perry	3,150	74,025	23½	135	2,025	15
Pike	3,142	81,692	26	221	3,536	16
Porter	23,124	820,902	35½	2,328	31,428	13½
Posey	1,816	69,008	38	36	1,080	30
Pulaski	21,327	703,791	33	1,194	16,716	14
Putnam	5,118	119,422	29	227	3,405	15
Randolph	9,332	289,292	31	289	3,901	13½
Ripley	4,807	127,386	26½	368	4,600	12½
Rush	1,607	57,049	35½	187	5,610	30
Scott	969	29,070	30	23	.....	.....
Shelby	1,856	61,248	33	15	450	30
Spencer	4,689	98,072	19	201	2,010	10
Starke	5,106	173,604	34	2,164	25,968	12
Steuben	5,978	191,296	32	297	4,158	14
St. Joseph	9,990	264,735	26½	926	12,038	13
Sullivan	1,3085	333,670	25½	271	3,388	12½
Switzerland	901	18,020	20	1,249	19,984	16
Tippecanoe	27,599	938,366	34	323	5,814	18
Tipton	1,331	47,916	36	131	2,358	18
Union	878	26,340	30	15	.....	.....
Vanderburgh	1,146	25,785	22½	143	2,860	20
Vermillion	8,928	343,728	38½	103	927	9
Vigo	12,092	296,254	24½	313	3,755	12
Wabash	17,406	626,616	36	130	2,600	20
Warren	31,063	1,133,300	36½	276	8,556	31
Warrick	4,389	109,725	25	128	1,280	10
Washington	14,862	356,688	24	106	1,272	12
Wayne	6,182	173,096	28	214	3,531	16½
Wells	14,813	681,398	46½	463	12,270	26½
White	77,370	2,630,580	34	784	8,624	11
Whitley	18,498	684,426	37	154	1,080	20
Total	999,100	36,801,186	.....	34,453	499,112	.....

TIMOTHY AND CLOVER.

Area and Production for 1899.

COUNTIES.	Timothy Hay for 1899.			Clover Hay, 1899.		
	Acres.	Tons.	Yield per Acre.	Acres.	Tons.	Yield per Acre.
Adams	18,781	18,781	1	9,409	11,761	1 $\frac{1}{4}$
Allen	35,847	44,809	1 $\frac{1}{4}$	8,202	12,303	1 $\frac{1}{2}$
Bartholomew	11,311	14,139	1 $\frac{1}{4}$	19,807	29,710	1 $\frac{1}{2}$
Benton	15,018	22,527	1 $\frac{1}{2}$	4,112	6,168	1 $\frac{1}{2}$
Blackford	4,799	13,152	1 $\frac{1}{2}$	4,260	6,620	1 $\frac{1}{2}$
Boone	12,597	22,045	1 $\frac{1}{4}$	24,587	49,174	2
Brown	8,768	13,152	1 $\frac{1}{2}$	4,413	6,620	1 $\frac{1}{2}$
Carroll	7,220	10,830	1 $\frac{1}{2}$	22,779	34,168	1 $\frac{1}{2}$
Cass	8,126	12,189	1 $\frac{1}{2}$	19,104	28,656	1 $\frac{1}{2}$
Clark	8,610	10,762	1 $\frac{1}{4}$	8,078	12,117	1 $\frac{1}{2}$
Clay	20,743	31,115	1 $\frac{1}{2}$	9,568	16,744	1 $\frac{1}{4}$
Clinton	8,323	14,565	1 $\frac{3}{4}$	26,626	53,252	2
Crawford	5,652	8,478	1 $\frac{1}{2}$	6,998	13,996	2
Daviess	11,351	11,351	1	14,833	22,250	1 $\frac{1}{2}$
Dearborn	18,918	23,647	1 $\frac{1}{4}$	5,071	8,874	1 $\frac{1}{4}$
Decatur	12,328	15,410	1 $\frac{1}{4}$	23,938	29,923	1 $\frac{1}{4}$
Dekalb	17,525	26,288	1 $\frac{1}{2}$	9,955	14,933	1 $\frac{1}{2}$
Delaware	13,333	16,666	1 $\frac{1}{4}$	17,212	25,818	1 $\frac{1}{2}$
Dubois	8,816	11,020	1 $\frac{1}{4}$	15,811	35,575	2 $\frac{1}{4}$
Elkhart	13,064	19,596	1 $\frac{1}{2}$	15,911	23,869	1 $\frac{1}{2}$
Fayette	5,422	8,133	1 $\frac{1}{2}$	14,259	24,953	1 $\frac{3}{4}$
Floyd	4,628	8,099	1 $\frac{3}{4}$	2,747	6,868	2 $\frac{1}{2}$
Fountain	10,695	16,043	1 $\frac{1}{2}$	12,454	18,681	1 $\frac{1}{2}$
Franklin	10,796	16,191	1 $\frac{1}{2}$	15,309	26,791	1 $\frac{3}{4}$
Fulton	9,885	14,828	1 $\frac{1}{2}$	17,246	25,869	1 $\frac{1}{2}$
Gibson	8,895	15,566	1 $\frac{3}{4}$	17,764	35,528	2
Grant	16,237	20,296	1 $\frac{1}{4}$	19,560	34,230	1 $\frac{3}{4}$
Greene	19,310	28,965	1 $\frac{1}{2}$	10,301	20,602	2
Hamilton	10,629	15,944	1 $\frac{1}{2}$	24,299	48,598	2
Hancock	7,973	11,960	1 $\frac{1}{2}$	22,720	45,440	2
Harrison	11,056	16,584	1 $\frac{1}{2}$	16,324	32,648	2
Hendricks	16,814	25,221	1 $\frac{1}{2}$	18,994	33,240	1 $\frac{3}{4}$
Henry	7,818	11,727	1 $\frac{1}{2}$	29,013	58,026	2
Howard	6,703	10,055	1 $\frac{1}{2}$	30,075	52,631	1 $\frac{3}{4}$
Huntington	15,739	27,543	1 $\frac{3}{4}$	13,051	16,314	1 $\frac{1}{4}$
Jackson	14,562	29,124	2	10,935	21,870	2
Jasper	18,584	18,584	1	1,357	1,357	1
Jay	18,448	27,672	1 $\frac{1}{2}$	22,552	39,466	1 $\frac{1}{2}$
Jefferson	8,563	10,704	1 $\frac{1}{4}$	11,776	17,664	1 $\frac{1}{2}$
Jennings	14,204	14,204	1	9,775	17,356	1 $\frac{1}{4}$

COUNTIES.	Timothy Hay for 1899.			Clover Hay, 1899.		
	Acres.	Tons.	Yield per Acre.	Acres.	Tons.	Yield per Acre.
Johnson	6,817	13,634	2	19,404	38,808	2
Knox	17,490	26,235	1½	18,958	83,177	1¾
Kosciusko	11,985	23,970	2	25,344	38,016	1½
Lagrange	9,912	14,868	1½	17,878	26,817	1½
Lake	88,783	88,783	1	387	484	1½
Laporte	12,358	12,358	1	5,432	6,790	1¼
Lawrence	307	384	1¼	15	30	2
Madison	347	434	1¼	9	18	2
Marion	15,351	23,027	1½	13,819	20,715	1½
Marshall	6,709	11,741	1¾	26,212	45,871	1¾
Martin	8,344	16,688	2	8,335	16,670	2
Miami	10,295	15,443	1½	23,560	29,450	1¼
Monroe	13,578	23,762	1¾	7,513	15,026	2
Montgomery	13,335	23,336	1¾	21,479	37,588	1¾
Morgan	10,114	17,700	1¾	10,480	13,100	2¼
Newton	13,616	17,020	1¼	1,463	1,829	1¼
Noble	9,381	14,072	1½	21,080	31,620	1½
Ohio	5,031	7,547	1½	1,576	2,364	1½
Orange	8,201	12,302	1½	11,931	17,897	1½
Owen	17,992	17,992	1	7,944	13,902	1¾
Parke	11,875	20,781	1¾	12,564	25,128	2
Perry	5,142	14,165	2¾	8,012	24,036	3
Pike	5,656	8,484	1½	11,638	17,457	1½
Porter	23,298	23,298	1	5,032	6,290	1¼
Posey	4,804	8,407	1¾	14,887	26,052	1¾
Pulaski	10,115	20,230	2	3,821	7,642	2
Putnam	16,940	29,645	1¾	16,708	33,416	2
Randolph	10,352	12,940	1¼	22,911	34,367	1½
Ripley	22,344	27,940	1¼	9,807	14,711	1½
Rush	7,050	12,338	1¾	30,914	54,100	1¾
Scott	3,954	4,943	1¼	7,353	11,030	1½
Shelby	8,346	12,519	1½	21,859	38,253	1¾
Spencer	8,679	13,018	1½	20,308	35,539	1¾
Starke	3,013	6,026	2	946	1,183	1¼
Steuben	11,553	17,330	1½	12,542	21,949	1¾
St. Joseph	13,168	16,460	1¼	13,019	16,274	1¼
Sullivan	13,185	19,778	1½	20,030	30,045	1½
Switzerland	11,012	13,765	1¼	5,360	8,040	1½
Tippecanoe	12,528	18,792	1½	16,552	24,828	1½
Tipton	6,887	10,331	1½	12,675	19,013	1½
Union	2,206	3,309	1½	14,070	28,140	2
Vanderburgh	5,948	8,922	1½	9,002	18,004	2
Vermillion	5,145	7,718	1½	4,618	6,927	1½
Vigo	12,727	22,272	1¾	8,567	12,851	1½
Wabash	16,240	20,300	1¼	18,172	18,172	1
Warren	7,853	9,816	1¼	7,857	11,785	1½
Warrick	8,415	12,622	1½	15,272	22,908	1½
Washington	15,332	30,664	2	13,115	39,345	3
Wayne	10,759	16,138	1½	21,515	32,273	1½
Wells	19,347	29,021	1½	12,237	21,415	1¾
White	18,291	22,864	1¼	6,062	7,578	1¼
Whiteley	12,701	15,876	1¼	9,559	11,948	1¼
Total	1,123,902	1,599,976	.....	1,240,988	2,091,534	.....

IRISH AND SWEET POTATOES.

Area and Yield for 1899.

COUNTIES.	Irish Potatoes, 1899.			Sweet Potatoes, 1899.		
	Acres.	Bushels.	Yield per Acre.	Acres.	Bushels.	Yield per Acre.
Adams	546	31,941	58½	.....	.....	.....
Allen	2,521	210,504	83½	.....	.....	.....
Bartholomew	621	20,814	33½	45	2,363	52½
Benton	578	44,795	77½	10	.....	.....
Blackford	111	3,885	35	1	.....	.....
Boone	330	.....	.....	8	.....	.....
Brown	439	25,901	59	19	1,425	75
Carroll	766	80,430	105	2	250	125
Cass	979	76,851	78½	5	337	67½
Clark	586	38,969	66½	68	3,638	53½
Clay	522	21,402	41	38	380	10
Clinton	1,074	67,662	63	5	50	10
Crawford	303	14,847	49	2	60	30
Daviess	171	9,662	56½	114	11,400	100
Dearborn	1,206	103,716	86	30	2,895	96½
Decatur	320	22,720	71	1	45	45
Dekalb	1,662	15,375	92½	13	.....	.....
Delaware	493	47,328	96	4	280	70
Dubois	534	46,992	88	1	63	63½
Elkhart	1,645	125,020	76	8	.....	.....
Fayette	364	20,930	57½	5	500	100
Floyd	739	49,143	66½	58	3,683	63½
Fountain	523	40,010	76½	10	300	30
Franklin	990	60,390	61	12	702	58½
Fulton	705	65,917	93½	1	37	37½
Gibson	378	29,106	77	33	2,475	75
Grant	366	30,012	82	12	396	33
Greene	301	30,100	100	20	3,930	196½
Hamilton	944	62,304	66	6	225	37½
Hancock	352	35,200	100	2	130	65
Harrison	956	73,134	76½	22	1,144	52
Hendricks	396	32,274	81½	10	750	75
Henry	636	55,650	87½	6	564	94
Howard	608	66,880	110	5	620	124
Huntington	682	42,966	63	5	150	30
Jackson	456	25,992	57	66	4,455	67½
Jasper	952	128,520	135	1	.....	.....
Jay	596	19,370	32½	39	1,501	38½
Jefferson	526	71,799	136½	41	4,449	108½
Jennings	252	15,498	61½	5	362	72½

COUNTIES.	Irish Potatoes, 1899.			Sweet Potatoes, 1899.		
	Acres.	Bushels.	Yield per Acre.	Acres.	Bushels.	Yield per Acre.
Johnson	120	5,880	49	.....	.....	.....
Knox	443	40,535	91½	16	1,600	100
Kosciusko	1,846	182,754	99	6	492	82
Lagrange	1,206	73,566	61	.....	.....	50
Lake	1,982	243,786	123	.....	.....	.....
Laporte	1,455	69,840	48	5	.....	.....
Lawrence	307	21,490	70	15	952	63½
Madison	347	15,095	43½	9	477	53
Marion	1,718	103,080	60	35	2,713	77½
Marshall	1,838	95,576	52	2	300	150
Martin	452	53,562	118½	5	487	97½
Miami	897	57,857	64½	1	.....	.....
Monroe	210	15,750	75	7	175	35
Montgomery	326	41,402	127	32	1,248	39
Morgan	224	22,624	101	1	72	72½
Newton	611	61,267	97	2	.....	.....
Noble	1,443	202,742	140½	1	.....	.....
Ohio	231	13,860	60	.....	.....	65
Orange	169	23,660	140	2	180	90
Owen	367	18,901	51½	6	300	50
Parke	288	18,720	65	8	184	23
Perry	273	24,991	67	6	750	125
Pike	602	37,625	62½	3	124	41½
Porter	1,424	113,208	79½	.....	.....	50
Posey	543	62,988	116	7	963	137½
Pulaski	564	37,228	66	5	.....	.....
Putnam	297	16,929	57	11	644	58½
Randolph	327	22,236	68	2	.....	.....
Ripley	1,729	152,288	87½	6	675	112½
Rush	227	21,565	95	273	38,220	140
Scott	141	16,215	115	3	750	250
Shelby	364	36,993	104½	2	280	140
Spencer	4,599	581,773	126½	65	5,143	74½
Starke	1,031	115,472	112	6	450	75
Steuben	963	77,040	80	.....	.....	50
St. Joseph	2,225	110,138	49½	13	585	45
Sullivan	114	6,441	56½	4	80	20
Switzerland	998	59,880	60	.....	.....	78
Tippecanoe	1,042	83,200	80	104	7,800	75
Tipton	73	8,943	122½	2	170	85
Union	132	10,560	80	.....	.....	.....
Vanderburgh	850	39,525	46½	15	773	51½
Vermillion	252	65,231	76½	.....	.....	80
Vigo	654	38,259	58½	148	8,880	60
Wabash	741	37,791	51	.....	.....	80
Warren	338	34,144	88	25	300	120
Warrick	894	37,546	42	44	1,826	41½
Washington	257	19,257	75	35	3,955	113
Wayne	670	32,495	48½	43	2,838	66
Wells	720	40,680	56½	14	1,540	110
White	795	63,600	80	2	.....	.....
Whitley	973	91,462	94	1	75	75
Total	68,561	5,441,677	.....	1,725	135,560	.....

HORSES AND MULES.

Horses and Mules for 1899, and Died During Year.

COUNTIES.	Horses.		Mules.		COUNTIES.	Horses.		Mules.	
	On Hand April 1, 1899.	Died During Year.	On Hand April 1, 1899.	Died During Year.		On Hand April 1, 1899.	Died During Year.	On Hand April 1, 1899.	Died During Year.
Adams	7,369	134	48	1	Madison	9,102	214	241	7
Allen	11,895	304	59	3	Marion	19,636	725	1,089	23
Bartholomew	6,622	269	1,707	57	Marshall	7,267	190	73	14
Benton	6,724	300	399	33	Martin	3,868	116	412	3
Blackford	3,405	46	101	3	Miami	7,280	206	127	3
Boone	12,123	200	264	8	Monroe	4,180	151	474	5
Brown	2,614	81	403	7	Montgomery	10,708	286	540	13
Carroll	7,512	240	199	7	Morgan	6,408	221	592	9
Cass	7,417	178	200	5	Newton	5,550	230	376	15
Clark	4,794	212	829	25	Noble	7,798	171	134	10
Clay	7,173	233	780	7	Ohio	1,021	31	173	7
Clinton	8,678	177	160	2	Orange	4,915	130	797	12
Crawford	2,611	84	336	5	Owen	4,421	106	588	5
Daviess	5,651	297	1,223	105	Parke	7,835	340	666	23
Dearborn	3,357	106	361	1	Perry	2,969	606	691	20
Decatur	6,203	165	1,305	25	Pike	4,255	281	742	27
Dekalb	3,537	159	60	5	Porter	6,471	211	73	5
Delaware	7,642	194	142	3	Posey	4,562	309	2,498	104
Dubois	4,931	143	869	24	Pulaski	6,576	236	143	5
Elkhart	9,363	106	64	1	Putnam	8,462	282	942	29
Fayette	3,618	257	199	13	Randolph	8,488	181	192	4
Floyd	2,133	115	238	13	Ripley	5,740	166	478	15
Fountain	18,084	224	322	6	Rush	7,589	295	254	4
Franklin	5,663	200	281	8	Scott	2,226	108	402	9
Fulton	6,038	211	67	2	Shelby	8,073	284	392	13
Gibson	6,767	399	1,866	41	Spencer	5,788	426	1,953	119
Grant	8,320	165	208	23	Starke	2,540	167	83	8
Greene	6,863	215	864	20	Steuben	4,741	88	62	10
Hamilton	7,714	263	378	14	St. Joseph	10,261	301	90	10
Hancock	7,030	237	169	2	Sullivan	8,142	288	566	21
Harrison	7,135	386	549	19	Switzerland	4,544	157	647	15
Hendricks	7,174	171	630	2	Tippecanoe	9,535	389	397	17
Henry	7,842	197	157	7	Tipton	5,071	128	131	8
Howard	7,729	202	195	4	Union	2,975	75	147	3
Huntington	7,679	155	116	2	Vanderburgh	5,620	160	2,509	28
Jackson	5,069	216	1,965	72	Vermillion	4,240	125	343	11
Jasper	6,331	414	281	10	Vigo	9,224	249	806	43
Jay	7,289	209	110	7	Wabash	7,594	189	146	6
Jefferson	5,527	222	688	25	Warren	7,213	243	422	13
Jennings	4,355	175	622	7	Warrick	6,009	223	2,275	26
Johnson	7,238	221	634	222	Washington	6,846	213	1,168	16
Knox	6,544	263	1,910	47	Wayne	9,497	277	200	8
Kosciusko	8,777	177	138	2	Wells	7,954	232	101	6
Lagrange	6,033	109	56	....	White	9,974	380	611	24
Lake	6,823	220	92	2	Whitley	5,147	119	90	..
Laporte	8,031	296	105	7	Total	614,303	20,255	48,966	1,749
Lawrence	4,561	143	871	25					

CATTLE AND HOGS.

Milk Cows and Other Cattle, Hogs and Losses, 1899.

COUNTIES.	Milk Cows on Hand.	All Other Cattle on Hand.	Cattle of all Kinds Died Past Year.	Hogs Over Three Months Old on Hand.	Hogs Died During Past Year.	Pigs Under Three Months Old on Hand.
Adams	5,674	6,469	237	18,823	11,127	12,908
Allen	11,373	10,609	449	23,869	17,028	17,001
Bartholomew	4,904	6,671	605	19,639	7,652	11,334
Benton	3,484	8,482	203	13,705	3,091	7,849
Blackford	2,437	2,814	107	9,412	4,014	6,577
Boone	8,844	12,238	1,061	40,045	5,507	32,577
Brown	2,001	2,222	217	7,019	426	3,494
Carroll	6,057	7,809	350	30,538	3,321	32,262
Cass	6,368	7,276	643	42,478	5,753	16,590
Clark	4,247	3,863	254	10,352	1,538	6,688
Clay	5,086	6,090	368	15,842	2,236	9,809
Clinton	6,671	9,824	367	37,125	6,951	29,664
Crawford	2,074	2,101	96	4,468	275	1,648
Daviess	5,676	6,390	505	22,159	2,113	13,336
Dearborn	4,187	3,092	160	5,433	511	3,187
Decatur	4,576	10,358	380	20,072	10,856	16,160
Dekalb	5,517	6,264	455	15,909	1,493	14,361
Delaware	6,652	9,974	469	29,062	8,350	22,316
Dubois	3,982	4,836	486	12,664	5,877	7,058
Elkhart	7,765	7,056	359	13,776	3,358	8,319
Fayette	2,848	4,572	377	13,668	6,576	8,201
Floyd	2,455	1,091	182	2,367	251	1,015
Fountain	5,735	6,504	702	21,670	5,992	17,140
Franklin	5,271	6,192	269	13,462	5,599	8,759
Fulton	4,403	6,260	328	10,277	17,117	9,544
Gibson	4,876	18,998	1,513	22,106	4,815	12,080
Grant	6,174	8,242	822	31,060	13,576	24,508
Greene	5,203	11,298	504	25,906	3,044	9,690
Hamilton	7,069	9,837	492	33,434	11,930	27,548
Hancock	5,410	7,780	411	53,630	18,063	18,097
Harrison	4,278	4,478	284	11,709	1,630	4,860
Hendricks	7,298	11,997	554	36,629	6,397	27,434
Henry	6,248	9,546	261	33,370	9,415	37,974
Howard	5,880	7,079	388	32,253	7,756	23,472
Huntington	5,824	9,631	431	23,098	11,875	14,632
Jackson	4,518	5,649	700	16,677	6,315	7,366
Jasper	4,895	16,119	485	18,779	5,812	4,838
Jay	5,380	10,317	483	20,235	15,500	16,440
Jefferson	4,704	5,245	538	9,785	1,377	4,946
Jennings	3,985	4,478	248	11,394	2,165	6,162

COUNTIES.	Milk Cows on Hand.	All Other Cattle on Hand.	Cattle of all Kinds Died Past Year.	Hogs Over Three Months Old on Hand.	Hogs Died During Past Year.	Pigs Under Three Months Old on Hand.
Johnson.....	5,004	9,628	915	28,310	10,697	16,712
Knox.....	4,459	9,192	469	19,900	7,169	13,559
Kosciusko.....	7,144	9,149	300	19,404	9,687	15,192
Lagrange.....	4,862	6,442	284	14,971	1,284	11,453
Lake.....	9,417	8,650	477	8,925	2,194	4,488
Laporte.....	8,141	8,329	432	11,601	5,012	7,275
Lawrence.....	12,936	12,644	318	19,710	1,451	6,076
Madison.....	9,610	10,773	608	30,252	11,366	31,067
Marion.....	8,980	6,424	435	21,368	8,501	10,913
Marshall.....	6,830	8,490	609	14,692	8,297	10,212
Martin.....	2,944	4,413	435	10,395	1,198	4,298
Miami.....	6,601	9,096	407	25,891	5,877	19,016
Monroe.....	3,149	5,241	169	9,222	1,155	5,105
Montgomery.....	7,453	11,820	708	43,076	14,049	30,989
Morgan.....	4,734	8,060	318	23,529	5,691	14,592
Newton.....	4,166	7,774	398	9,138	3,616	6,562
Noble.....	6,840	10,362	183	17,360	3,399	15,109
Ohio.....	1,191	975	58	2,414	123	1,509
Orange.....	3,787	5,067	333	8,696	1,675	4,440
Owen.....	4,173	6,468	238	11,461	2,217	6,313
Parke.....	5,046	8,023	1,750	23,920	3,939	16,372
Perry.....	2,436	3,301	190	6,130	843	2,745
Pike.....	2,900	4,040	199	13,173	2,902	7,060
Porter.....	10,060	7,637	446	8,830	6,439	5,805
Posey.....	3,575	3,591	555	12,130	3,735	7,672
Pulaski.....	5,606	7,192	277	9,311	3,570	7,096
Putnam.....	6,235	13,780	326	44,959	5,821	31,400
Randolph.....	6,637	7,795	334	29,915	15,466	20,403
Ripley.....	6,996	5,400	379	12,831	2,483	8,930
Rush.....	4,680	9,486	517	36,692	18,016	27,061
Scott.....	2,049	1,507	45	7,181	486	2,202
Shelby.....	5,509	6,445	845	27,606	16,777	15,472
Spencer.....	3,503	4,380	306	16,403	2,817	6,238
Starke.....	2,936	3,481	233	4,423	653	2,169
Steuben.....	3,790	5,003	142	11,030	3,106	10,740
St. Joseph.....	8,072	5,263	438	13,788	1,626	6,719
Sullivan.....	5,442	8,572	1,172	19,129	6,583	13,198
Switzerland.....	3,290	2,725	127	5,449	304	2,265
Tippecanoe.....	6,186	9,473	692	26,507	7,995	18,340
Tipton.....	3,943	5,724	312	22,087	9,118	15,625
Union.....	2,492	3,806	191	11,381	7,476	8,788
Vanderburgh.....	4,428	1,348	208	5,872	1,098	2,789
Vermillion.....	3,187	4,226	293	12,836	2,593	7,338
Vigo.....	5,301	9,666	233	13,029	2,253	8,467
Wabash.....	5,943	9,374	335	22,347	7,633	18,648
Warren.....	3,773	7,557	687	23,425	3,849	15,272
Warrick.....	3,943	3,669	343	18,369	1,439	6,021
Washington.....	5,954	7,362	302	23,922	1,549	9,340
Wayne.....	7,156	9,318	9,939	26,264	14,788	19,228
Wells.....	6,769	7,460	290	23,793	27,693	16,537
White.....	6,580	12,218	597	22,094	5,112	11,603
Whitley.....	4,813	6,808	246	15,436	3,476	10,359
Total.....	492,680	665,478	48,896	1,756,476	553,930	1,145,936

SHEEP, LAMBS AND WOOL.

Sheep, Lambs, Wool and Slaughtered Animals, 1899.

COUNTIES.	Sheep on Hand April 1, 1899.	Lambs on Hand April 1, 1899.	Pounds of Wool Clipped, 1899.	Sheep Killed by Dogs.	Sheep Affected With Scab.	Sheep Died Past Year.	Value of all Ani- mals Slaughtered on Farm.
Adams	15,875	9,256	70,657	132	169	673	55,822
Allen	20,938	11,733	116,190	315	11	1,195	181,177
Bartholomew	4,406	3,060	25,046	319	5	362	81,108
Benton	4,849	979	10,183	82	.....	228	11,111
Blackford	6,941	2,472	37,695	79	.....	430	12,459
Boone	16,501	7,345	56,440	202	254	879	59,451
Brown	5,312	4,034	21,873	111	48	252	25,157
Carroll	10,925	5,696	54,638	122	27	857	56,755
Cass	16,351	8,910	91,681	454	18	1,090	29,534
Clark	2,839	2,201	14,807	63	4	194	29,391
Clay	4,499	3,274	21,704	113	22	322	58,839
Clinton	9,893	6,304	51,329	213	188	866	58,626
Crawford	3,075	2,343	14,820	28	14	128	21,691
Daviess	5,389	2,468	26,225	79	12	412	50,223
Dearborn	2,612	2,387	13,297	53	.....	115	32,802
Decatur	6,210	4,353	32,973	159	35	473	24,156
Dekalb	19,737	9,769	101,922	413	18	979	65,756
Delaware	12,560	5,344	77,559	257	477	867	34,055
Dubois	3,477	1,683	15,370	74	41	107	42,154
Elkhart	19,403	7,596	89,758	171	123	1,164	71,796
Fayette	11,656	2,433	22,524	176	248	900	21,743
Floyd	437	285	2,013	22	3	19	16,207
Fountain	13,764	7,016	16,522	911	143	1,131	39,586
Franklin	7,027	4,735	35,455	34	361	622	36,665
Fulton	17,239	11,187	101,515	63	159	1,270	29,784
Gibson	4,308	1,940	24,734	68	35	410	47,563
Grant	21,308	7,584	84,368	315	504	761	48,218
Greene	12,406	5,274	58,899	262	4	480	58,577
Hamilton	9,521	5,108	56,641	266	568	721	49,364
Hancock	7,616	3,805	70,824	76	372	663	46,326
Harrison	2,888	1,752	14,704	82	10	295	92,949
Hendricks	14,296	7,731	69,568	250	380	706	57,032
Henry	7,879	5,107	53,471	589	71	551	52,327
Howard	7,381	3,795	39,627	57	49	465	56,418
Huntington	14,288	8,038	83,174	163	196	862	65,408
Jackson	3,829	2,436	19,745	149	22	237	57,607
Jasper	3,151	1,114	15,527	12	3	309	25,454
Jay	18,267	10,060	94,466	152	275	1,064	118,553
Jefferson	5,440	3,532	27,236	116	12	398	25,037
Jennings	6,248	3,518	28,018	65	23	321	26,236

COUNTIES.	Sheep on Hand April 1, 1899.	Lambs on Hand April 1, 1899.	Pounds of Wool Clipped, 1899.	Sheep Killed by Dogs.	Sheep Affected With Scab.	Sheep Died Past Year.	Value of all Ani- mals Slaugh- tered on Farm.
Johnson.....	7,484	4,431	33,476	373	55	427	34,511
Knox.....	3,385	1,883	17,276	151	20	234	48,154
Kosciusko.....	30,757	16,040	183,840	120	36	2,093	7,787
Lagrange.....	28,797	15,884	165,323	221	240	1,637	42,150
Lake.....	2,231	1,238	14,035	13	.....	161	30,052
Laporte.....	8,681	4,641	78,538	257	67	656	33,160
Lawrence.....	5,034	2,545	23,743	93	20	250	40,388
Madison.....	7,765	5,911	39,292	230	21	484	45,821
Marion.....	4,147	2,467	20,710	238	102	263	48,743
Marshall.....	19,996	10,216	88,691	284	5	1,308	73,496
Martin.....	8,439	5,677	38,574	140	93	363	25,515
Miami.....	12,954	6,129	64,661	196	95	746	52,967
Monroe.....	8,949	4,499	62,774	220	30	335	37,110
Montgomery.....	28,745	13,169	139,741	547	798	2,078	65,084
Morgan.....	8,147	4,605	41,922	170	422	533	51,578
Newton.....	1,631	2,674	8,334	18	.....	95	14,161
Noble.....	28,751	15,791	176,841	148	10	2,544	55,012
Ohio.....	2,369	2,060	10,023	37	1	119	7,925
Orange.....	6,650	4,625	60,491	88	33	368	42,662
Owen.....	15,055	6,289	67,969	154	21	939	39,047
Parke.....	14,750	8,741	82,761	245	205	1,126	46,423
Perry.....	2,065	1,320	7,588	64	3	111	25,267
Pike.....	3,175	2,174	20,877	134	27	201	35,724
Porter.....	5,013	2,205	29,648	82	22	252	17,611
Posey.....	2,227	1,063	11,122	19	11	226	74,384
Pulaski.....	5,766	3,948	37,775	42	2	428	40,316
Putnam.....	14,058	8,204	108,078	318	109	863	115,790
Randolph.....	7,359	4,363	47,664	126	38	620	62,791
Ripley.....	4,853	3,113	21,950	82	94	215	31,759
Rush.....	9,460	4,365	45,364	957	230	1,143	40,227
Scott.....	1,264	993	5,986	83	1	53	12,910
Shelby.....	4,738	2,338	25,931	152	22	295	183,496
Spencer.....	8,103	1,165	8,300	68	4	79	108,420
Starke.....	1,614	796	7,958	12	7	173	28,720
Steuben.....	31,548	13,714	180,364	116	5	1,523	28,668
St. Joseph.....	10,441	4,824	61,524	109	33	684	187,910
Sullivan.....	9,273	5,528	55,075	429	842	811	46,647
Switzerland.....	5,124	3,730	25,955	96	30	289	33,322
Tippecanoe.....	8,895	2,979	45,235	170	39	568	61,444
Tipton.....	5,039	3,052	80,458	106	269	414	12,972
Union.....	3,451	1,869	20,816	38	28	199	19,166
Vanderburgh.....	563	347	2,947	27	5	39	43,213
Vermillion.....	1,817	830	9,202	23	14	173	21,959
Vigo.....	1,793	1,153	11,958	23	13	112	191,843
Wabash.....	18,614	11,733	108,651	152	24	1,209	52,331
Warren.....	6,683	2,878	58,466	55	179	667	36,297
Warrick.....	3,322	2,333	16,242	32	21	247	141,598
Washington.....	9,812	7,345	51,920	47	9	496	56,940
Wayne.....	5,850	3,652	32,304	267	52	280	50,324
Wells.....	12,759	7,773	83,186	288	260	767	67,692
White.....	4,681	2,705	29,297	85	75	262	42,460
Whitley.....	16,206	9,443	97,423	315	73	1,348	37,727
Total.....	861,024	459,097	4,631,477	15,727	9,719	55,284	4,795,639

MILK, BUTTER, CHEESE, EGGS AND POULTRY.

Milk, Butter, Cheese, Poultry and Eggs, Product for 1899.

COUNTIES.	Milk, 1899, Gallons.	Butter, 1899, Pounds.	Cheese, 1899, Pounds.	Poultry, 1899, Dozens.	Eggs, 1899, Dozens.
Adams	2,118,319	401,936	61,613	6,795	660,320
Allen	3,922,510	840,443	409,466	13,060	819,464
Bartholomew	1,278,128	353,983	1,530	14,607	349,044
Benton	981,301	143,461	.....	4,396	108,516
Blackford	381,390	56,560	.....	2,729	115,515
Boone	1,698,406	533,400	418	30,700	762,106
Brown	512,611	163,065	823	68,956	209,818
Carroll	1,576,232	430,193	50	15,810	592,594
Cass	1,245,319	298,720	781	8,870	623,792
Clark	1,488,394	333,657	391	9,167	321,067
Clay	1,254,832	430,487	922	11,678	230,901
Clinton	2,805,069	417,619	172	14,818	419,726
Crawford	502,687	163,463	.....	3,905	246,992
Daviess	1,123,617	298,052	338	15,857	279,573
Dearborn	1,422,042	405,150	216	6,619	394,370
Decatur	933,748	260,725	130	8,695	316,462
Dekalb	1,689,054	555,697	410	10,937	883,514
Delaware	2,432,970	579,442	.....	10,943	580,399
Dubois	435,048	163,768	1,024	3,999	307,395
Elkhart	2,837,326	511,862	500	15,947	937,656
Fayette	819,405	240,536	81	8,003	220,375
Floyd	897,120	263,046	.....	4,050	126,199
Fountain	978,775	240,478	141	18,876	228,171
Franklin	1,515,235	440,424	1,093	11,322	707,329
Fulton	1,144,886	324,924	175	26,986	389,619
Gibson	1,223,227	389,675	40	18,930	323,732
Grant	3,903,093	417,552	96	28,297	486,182
Greene	1,270,099	331,778	2,385	11,935	471,029
Hamilton	2,069,756	582,854	2,947	15,216	552,647
Hancock	1,601,851	462,484	3,000	12,460	573,723
Harrison	1,466,652	457,879	1,587	11,191	626,461
Hendricks	1,697,607	413,819	68,794	19,461	432,931
Henry	2,225,544	374,705	5,008	13,838	480,321
Howard	1,480,396	389,431	1,834	15,766	399,062
Huntington	1,863,735	440,103	100	11,539	432,275
Jackson	1,038,974	385,322	4,350	14,489	448,915
Jasper	971,280	186,037	3,425	7,948	227,915
Jay	1,598,890	429,872	774	12,447	773,430
Jefferson	1,470,779	286,458	3,873	8,799	454,059
Jennings	819,045	236,199	1,662	20,512	323,379

COUNTIES.	Milk, 1899, Gallons.	Butter, 1899, Pounds.	Cheese, 1899, Pounds.	Poultry, 1899, Dozens.	Eggs, 1899, Dozens.
Johnson	1,492,783	438,946	50	19,370	408,584
Knox	1,008,722	253,734	7,014	14,189	758,072
Kosciusko	2,206,748	523,311	10	12,064	749,886
Lagrange	2,021,415	547,785	2,000	8,002	402,635
Lake	10,341,357	315,182	619	7,200	297,302
Laporte	1,857,827	354,754	844	7,516	273,321
Lawrence	746,429	191,134	756	6,760	281,644
Madison	2,267,392	500,270	918	17,240	512,738
Marion	4,599,088	671,537	2,512	20,360	1,653,577
Marshall	1,651,495	386,821	1,748	11,812	565,276
Martin	980,662	375,170	833	8,109	274,334
Miami	1,783,568	405,152	351,913	10,065	463,809
Monroe	836,633	196,815	1,313	7,363	214,477
Montgomery	1,484,569	392,875	953	20,628	366,588
Morgan	1,022,841	246,627	.....	18,754	440,350
Newton	374,934	58,810	75	12,211	174,958
Noble	2,048,526	420,006	20	24,205	533,921
Ohio	351,855	107,842	1,780	1,852	124,000
Orange	826,357	233,603	41	21,074	370,021
Owen	1,222,605	258,558	1,505	7,561	388,532
Parke	1,133,561	315,396	1,002	22,188	349,542
Perry	661,115	211,814	12	22,343	216,704
Pike	483,556	152,232	.....	22,607	216,304
Porter	2,190,265	230,467	3	4,940	185,431
Posey	618,114	199,765	268	8,112	276,566
Pulaski	1,012,847	222,574	.....	9,469	234,604
Putnam	1,294,430	338,038	40	16,174	490,028
Randolph	2,070,063	544,695	400	29,579	501,424
Ripley	1,707,913	522,601	10,550	8,747	674,165
Rush	1,374,500	323,483	500	16,407	332,977
Scott	418,645	161,105	4	3,433	190,671
Shelby	2,100,823	407,437	122	19,963	459,357
Spencer	739,243	287,856	112	9,595	399,335
Starke	537,755	125,578	12	4,167	110,197
Steuben	1,524,630	411,796	.....	6,123	387,023
St. Joseph	2,796,805	527,445	950	9,099	346,180
Sullivan	1,098,026	311,836	7	15,970	462,550
Switzerland	800,585	314,739	2,239	12,200	785,684
Tippecanoe	1,425,816	385,742	9,500	15,893	324,867
Tipton	702,525	136,062	100	6,860	231,681
Union	1,324,702	249,061	75	6,595	196,175
Vanderburg	2,425,203	285,793	304	4,689	162,487
Vermillion	756,415	204,312	398	9,972	157,232
Vigo	1,801,952	324,498	549	13,680	277,029
Wabash	1,839,135	498,491	100	12,835	554,337
Warren	653,585	190,473	6	7,670	190,988
Warrick	855,879	353,497	331	9,578	381,435
Washington	1,697,885	518,474	500	18,847	1,183,523
Wayne	2,920,014	425,960	93,388	35,204	408,422
Wells	2,899,965	620,981	6,880	12,825	608,459
White	1,102,882	266,423	.....	12,900	321,755
Whitley	1,543,684	371,325	.....	6,760	395,411
Total	144,533,666	31,905,146	1,083,403	1,241,702	39,089,769

LABOR.

Farm and Domestic Labor, 1899.

COUNTIES.	No. Farm Hands Regularly Em- ployed.	Average Wages Per Month, With Board.	No. Females Employed in Families.	Average Wages Per Week, With Board.	COUNTIES.	No. Farm Hands Regularly Em- ployed.	Average Wages Per Month, With Board.	No. Females Employed in Families.	Average Wages Per Week, With Board.
Adams	282	\$12 71	74	\$1 24	Madison	505	\$14 93	155	\$1 66
Allen	567	13 35	438	1 58	Marion	664	13 26	1,645	1 59
Bartholomew	605	14 71	120	2 08	Marshall	269	14 09	62	1 37
Benton	858	15 86	108	2 20	Martin	152	14 02	95	1 33
Blackford	49	12 28	9	1 77	Miami	324	13 90	97	1 54
Boone	329	15 87	158	1 54	Monroe	123	15 28	14	1 84
Brown	75	12 02	27	1 38	Montgomery	574	14 83	176	1 49
Carroll	447	15 19	97	1 51	Morgan	387	15 77	67	1 61
Cass	343	13 40	99	1 57	Newton	493	16 17	102	2 23
Clark	282	12 47	90	1 42	Noble	331	14 53	139	1 58
Clay	746	14 10	609	1 59	Ohio	22	12 28	14	1 22
Clinton	427	14 69	145	1 53	Orange	197	13 03	19	1 46
Crawford	75	12 28	28	1 40	Owen	189	14 17	42	1 24
Daviess	388	14 02	157	1 42	Parke	643	15 41	124	1 50
Dearborn	156	13 02	45	1 40	Perry	139	11 17	26	1 80
Decatur	438	13 64	107	1 40	Pike	153	14 51	39	1 16
Dekalb	320	12 32	177	1 65	Porter	289	14 66	58	2 05
Delaware	351	13 61	115	1 58	Posey	821	14 67	95	1 62
Dubois	225	12 85	342	1 45	Pulaski	187	14 17	33	1 56
Elkhart	333	14 77	123	1 66	Putnam	289	16 55	115	1 77
Fayette	352	14 58	105	1 70	Randolph	263	13 06	47	1 54
Floyd	127	13 34	16	2 00	Ripley	249	12 67	55	1 62
Fountain	393	14 41	90	1 44	Rush	716	14 71	175	1 67
Franklin	273	13 48	89	1 42	Scott	105	12 91	16	1 00
Fulton	172	13 73	69	1 47	Shelby	850	13 68	140	1 46
Gibson	698	15 01	152	1 33	Spencer	364	12 63	122	1 22
Grant	362	12 72	132	1 88	Starke	101	12 51	13	1 70
Greene	314	13 34	67	1 21	Steuben	279	13 41	130	1 62
Hamilton	298	14 62	69	1 41	St. Joseph	469	15 65	495	1 87
Hancock	373	13 48	119	1 64	Sullivan	734	13 36	64	1 27
Harrison	215	12 32	107	1 38	Switzerland	81	11 60	41	1 02
Hendricks	335	14 89	87	1 66	Tippecanoe	858	15 19	149	1 87
Henry	329	14 52	61	1 53	Tipton	236	15 31	67	1 84
Howard	263	15 46	54	1 47	Union	233	15 73	59	1 54
Huntington	239	13 85	60	1 47	Vanderburgh	584	12 64	597	1 72
Jackson	393	10 50	94	1 49	Vermillion	245	13 96	51	1 43
Jasper	448	14 63	89	1 96	Vigo	476	14 45	46	1 52
Jay	197	13 33	105	1 51	Wabash	338	14 72	38	1 79
Jefferson	264	13 56	54	1 52	Warren	518	16 70	61	1 84
Jennings	159	11 55	38	1 23	Warrick	393	11 70	55	1 19
Johnson	458	14 80	76	1 44	Washington	253	12 91	61	1 09
Knox	972	11 97	140	1 53	Wayne	363	14 42	288	1 72
Kosciusko	331	13 95	85	1 38	Wells	231	14 84	122	1 60
Lagrange	563	13 25	101	1 87	White	511	14 50	81	1 77
Lake	444	14 10	76	1 87	Whitley	219	12 47	100	1 48
Laporte	450	14 56	157	1 80	Total	33,404	127,785 00	11,714	14,364 00
Lawrence	267	15 54	174	1 65	Average .....	.....	\$13 89	.....	\$1 56

· SPECIAL REPORT
OF THE
Indiana State Board of Agriculture
ON
THE HOG.

PREPARED UNDER THE DIRECTION OF HON. W. W. STEVENS, MEMBER OF
THE BOARD, AND CHARLES DOWNING, SECRETARY.

INTRODUCTORY.

The Indiana State Board of Agriculture is very desirous of enlarging its sphere of usefulness, and to this end herewith presents the first of a proposed series of special reports on such leading agricultural topics as are of paramount importance to the farmer.

The swine industry is first to receive consideration. The hog has always been an important factor in the State's advancement, and in order that he may be still better understood and become a more important factor than ever before in the commonwealth's prosperity and welfare, his rearing and successful management from start to finish is carefully considered.

Probably the most complete and carefully prepared work on swine diseases and their remedies ever issued in this country is presented herewith, and the very best talent in the land has contributed interesting and valuable suggestions along the lines of practical breeding and management.

We felt that no one man knew all there was worth knowing on a subject so extensive and important as that of swine husbandry, and therefore drew upon a host of practical breeders and specialists for such contributions as we thought would make the most valuable report.

To all who have thus gratuitously given us a helping hand we are under lasting obligations, and to them we will give credit for any good results that may follow.

W. W. STEVENS,
For the Board.

BREEDS OF SWINE.

To give anything like a complete history of the different breeds of swine bred in this country would require more space than is allowed us for this special report, so we must, under the above heading, give only a very brief synopsis of the characteristics of the different breeds that are favorites among our farmers.

The introduction of the hog into this country dates back to the very first settlements. It is said that Columbus brought swine to Hispanolia in the year 1493. They were introduced into Florida by DeSoto in 1538. They were first introduced into Virginia in 1609. It is said that the fecundity of swine in Virginia forests was so great that in eighteen years after their introduction the inhabitants of Jamestown had to palisade the town to keep them out. There were no wild hogs in America when first discovered, but they soon ran wild as then managed, and spread rapidly through many parts of the country. The improved swine we have to-day is not the outcome of the wild hog, but has gradually developed from the frequent importation of the best breeds found in other countries. The origin and history of the several prominent breeds will necessarily have to be very brief in this connection.

THE POLAND-CHINAS.

The contentions and discussions among the breeders and friends of the different strains of these hogs as to their origin and name, as well as who should have the most credit for efforts to perfect and bring them into popular favor, would, if published, fill volumes. Among the names which have been given them from time to time, and by which they are still known in some parts of the country, are, "Magie," "Moore," "Poland," "Butler County," "Big-boned China," etc. This breed had its origin in that part of southwestern Ohio lying between the Big Miami and Little Miami rivers, namely, in the counties of Butler and Warren, during the years from 1835 to 1840. It is also generally conceded that the groundwork was stock locally known as Warren County hogs, and these were the result of crossing together the "Byfield," the "Russia" and the "Big Chinas." Later on the Irish Grazier blood was introduced, and probably some Berkshire blood was mixed in as well. No one man probably had more to do in the formation of this breed than another. It was, in fact, the result of the labors of many. For more than half a century now they

have been bred as a distinct breed without any infusion of foreign blood, and in the hands of progressive breeders have developed into probably the most popular breed of swine found in the whole country.

This breed of swine has gradually developed with the country, or rather has been bred up to meet the demands of farmers in the great corn belt of the United States where large size, quick maturity and hardiness are the main characteristics of a hog. In the detailed description of the Poland-China as now bred, we find the following characteristics:

Head short and wide; face short and slightly dished; eyes large and prominent; ears small and thin, with tips drooping gracefully; neck wide, deep and short, and slightly arched; jowl broad and deep; shoulders deep and full; chest large, deep and roomy, making a large girth just back of the shoulders; back broad, carrying same width from shoulder to ham; sides and ribs full and smooth; belly and flank wide, straight and full; hams and rump broad, full, long and wide; legs and feet medium length, straight, set well apart and squarely under the body; tail small, smooth and tapering; coat fine, straight and smooth; color black, with white face or on lower jaw; white on feet and tip of tail, and a few small, clear white spots on body not objectionable; size, large for age and condition; boars two years old and over, if in good flesh, should weigh not less than 500 pounds. Sows, same age and condition, not less than 450 pounds. Boars, eighteen months old, in good condition, not less than 400 pounds; sows, 350 pounds. Boars, twelve months old, not less than 300 pounds; sows, 300 pounds. Boars and sows, six months old, not less than 150 pounds. Other ages in proportion.

BERKSHIRES.

The first importation of Berkshires into America of which we have any record was in 1823. For some years this breed was very popular, and large importations were made. But the careless, neglectful systems then in vogue with too many farmers are not adapted to maintaining the good qualities given the breed by English breeding and feeding, and deterioration followed, and the breed was everywhere discarded. About 1865 new importations were made and the breed suddenly sprang into popularity again, and is now widely disseminated through all parts of the country. When fine quality of meat is the object sought for the Berkshire probably stands second to no other breed. Great improvement has been made in size and symmetry in the past forty years, but the spirit of improvement is still abroad and the standard of perfection is placed high.

Prominent among the good qualities that seem to make them favorites are:

1. Great muscular power and vitality which render them less liable to disease than some other breeds.
2. Activity combined with strong digestive and assimilative powers.

3. They are remarkable for their prolificacy, as well as for being careful mothers and good sucklers.

4. The pigs are strong, smart and active at birth and consequently less liable to mishaps.

5. They fatten readily at any age, while they may be fed to any reasonable weight desired.

6. Their flesh is the highest quality of pork.

7. Power of the boar to transmit the valuable qualities of the breed to its progeny, when used as a cross.

8. Their unsurpassed uniformity in color, marking and quality.

It is doubtful if we have any hog that is nearer thoroughbred in its best sense or more certain to reproduce themselves with fidelity, than the improved Berkshires crossed with other breeds, especially the larger ones. They make the best feeding hogs possible.

Characteristics.—Head and face short and well dished; eyes large and dark hazel or gray; ears medium size and erect; neck full, deep and arched; jowl firm and neat; shoulders broad, deep and full; chest large, wide and roomy; back broad and straight; hams broad, full and long; legs straight and strong; coat firm, straight and smooth; color, black, with white on feet, face, tip of tail and an occasional splash on arm; size, large for age. Boar, two years old and over, not less than 450 pounds; sow, same age, 400 pounds. Boars, eighteen months old, 350 pounds; sow, same age, 325 pounds. Boar, twelve months old, 300 pounds.

CHESTER WHITE.

The Chester County white hog is a native of Chester County, Pennsylvania. In the year 1818 a pair of fine white pigs was imported from Bedfordshire, England. They proved to be a good hog, and by careful selection and judicious crossing for many years the modern Chester White was produced. They are appropriately classed with the large breeds, growing, if kept, to probably the largest size of any other hog, and they will hold their white color perfectly under all circumstances. Docility and cleanliness are some of their marked characteristics. The greatest objection urged against the breed is their lack of hardiness, or their tendency to degenerate under careless treatment or neglect. Their description calls for:

Head and face short and wide; eyes large and bright; ears medium size and pointing forward; neck short and thick; jowl large; back and loin broad and straight; body lengthy and deep; hams broad and deep; legs short and straight and well set apart; coat firm and either straight or wavy; color white; the action easy and graceful, and style attractive; disposition is quiet, and they are easily handled; take good care of themselves; size large for age and condition; boars two years and over, if in good flesh, should weigh not less than 500 pounds. Sow, same age and

condition, not less than 450 pounds. Boars, eighteen months old, in good flesh, should weigh not less than 400 pounds; sows, 350. Boars, twelve months old, not less than 300 pounds; sows, 300. Boars and sows, six months old, not less than 150 pounds each, and other ages in proportion.

VICTORIAS.

This is a breed that has not won a very wide reputation throughout the country, but they are a hog of considerable merit, and are fancied by good breeders here and there in many parts of the country. Mr. Leland, of New York, says they originated in Saratoga County, of that State. They were made by crossing the Byfield hog with the native in which there was a strain of the Grazier. Subsequent crosses were made with the Yorkshire and Suffolk, the result being a purely white hog of medium size. These pigs, if pure bred, should all have a direct descent from a sow called Queen Victoria, which may be said to be the mother of the family. They seem to suit breeders in the Eastern States, where a medium-sized hog is desirable, and white is not an objectionable color. In size, boars two years old and over, when in good condition, should weight not less than 550 pounds; sows, same age and condition, 450 pounds. Boars, twelve months old, not less than 300 pounds; sows, in good flesh, 250 pounds. Pigs, five to six months old, 140 to 160 pounds.

SUFFOLKS.

This is an old breed of swine of English origin, and it is a true breeder. It is probably the most popular breed in England. It attains maturity at an early age and is said to be always in condition to kill from the time they are a month old. The breeders of this hog claim that they get from it the most meat to the least bone and the most pork with the least food. They are highly recommended for crossing on other hogs. They are invariably white, but sometimes have bluish spots on the skin. They can be made to weigh four hundred pounds.

ESSEX.

The Essex is a black hog, originating in the south of England. They are very squarely built, fatten easily and weigh, when full grown, from 250 to 275 pounds. For the gentleman in town, or the small farmer, they will give satisfaction. They thrive well on pasture without any grain food. They will get fat and ready for the market on clover. Their color enables them to withstand the hottest sun of July or August without having their skin the least affected, and they are never known to scald or mange. They have the power of transmitting to their progeny an excess of their good qualities. They are very prolific.

THIN RINDS.

The Thin Rind hog was imported into America from the Hampshire districts of England. The earliest importations to this country came to Massachusetts, where they were known as the McKay hog, the name probably taken from the importer. They also were imported into Canada, where they were called the Hampshire, and from Canada they found their way into New York, where they were called the ring-middle hog, on account of having a white belt around the body.

The type which is being bred by the American Thin Rind Association came from New Jersey into Boone County, Ky., in 1835, and was long known as the Belt breed until the name Thin Rind was given it by some of its admirers on account of its glossy coat of hair and soft, mellow skin. Its admirers commend it as an ideal hog possessing all the hardness and vitality and prolificacy of the unrestrained muscular animal of pioneer times. In color they are either listed or blacks, the most desirable consisting of black extremities with a white belt from three to ten inches wide, encircling the body and including the forelegs. They have small heads; ears of medium length, slightly inclining forward; jowl very light; broad back of nearly uniform width, slightly arched, standing very erect on feet, with legs set well apart, denoting great carrying capacity. The Thin Rind breeders claim that jowl and flabby belly are cheap meats, and that they have bred grossness down to the minimum. Early maturity, docility and fattening qualities are strong points for the Thin Rind. It is also claimed that they are distinctly a lean meat hog, and the best bacon type, and that the color is admired by all.

DUROC-JERSEYS.

The origin of the "red hog," known to-day as the Duroc-Jersey, can not be positively traced, and was evidently unknown to the earliest historians of the hog. They have been traced back over half a century, but earlier than that very little is known of them.

It is generally conceded by those interested in this popular breed of swine that there were two families of them some years ago, one known as the Jersey Red, and the other as Duroc or Red-Rocks. In some of the counties of New York they were called Durocs, while in others they were called Red-Rocks.

Joseph B. Lyman has the credit of first giving the red hog the name Jersey-Red. He was agricultural editor of the New York Tribune at the time, and resided in New Jersey, and in discussing the merits of the red hog in New Jersey he called them Jersey-Reds; hence the name. Previous to his naming them they had simply been called "red hogs." Mr. Lippincott, of New Jersey, was the first man to advertise the hogs as Jersey-Reds.

Clark Petit's history of Jersey-Reds states that in 1832 there was a pair of red pigs shipped to Salem, New Jersey, but did not state who was the importer or exporter.

The question arises in the mind of the intelligent imaginer how the red hogs known as the Jersey-Reds sprang from the progeny of this pair of pigs. Oldest citizens of Windsor, New Jersey, could not trace them twenty years ago, and they were bred with uniformity and great size then as we are told. The same reports come from Burlington and adjoining counties of New Jersey, forcing the conclusion that there must have been red hogs there prior to 1832, or they would not have been the best variety known to the farmers of that State at the time they were. The name Duroc was given by Isaac Frink, a prominent farmer living in Milton, Saratoga County, New York. He named them for a noted stallion owned by Henry Kelsey, in the town of Florida, Montgomery County, New York. Mr. Kelsey had a red sow with a litter of red pigs, claiming he had imported the sire and dam. Mr. Frink bought a pair of pigs and called them Durocs. Concerning their characteristics Mr. J. D. Kiger says:

"Many breeders who have at different times raised two or three varieties of swine assert that the Duroc-Jerseys are the best general-purpose hogs in America, having a stronger constitution, being more prolific and better sucklers. As bred to-day they grow faster when young and fatten as readily as a pig when matured, and will put on more flesh for a given amount of feed than any other hog. They are doubtless the most prolific of any breed of swine in existence. Young sows usually farrow from eight to twelve pigs at a litter, and from ten to eighteen is not uncommon for old sows. The pigs are very strong at birth, and the sow and pigs very seldom need any attention at this time. They almost invariably impart to their offspring their wonderful prolific breeding qualities; are good, quiet mothers, supplied with a generous flow of milk, raise large, even litters, and other breeds when crossed with them are greatly improved in vigor, and as breeders and feeders."

DISEASES OF THE PIG.

BY A. W. BITTING, D. V. M., M. D., AND R. A. CRAIG, D. V. M., PURDUE UNIVERSITY.

DISEASES OF THE MOUTH.

INFECTIOUS SORE MOUTH OF PIGS.

This disease is especially prone to attack sucking pigs, and while no special germ has ever been discovered which causes the trouble, the history of the cases makes it seem very probable that the disease is infectious.

Symptoms.—This disease is characterized by ulceration within and outside of the lips. Its favorite seat is inside of the lips, just in front of the point of union on each side. The disease extends inward to about the line of union between the lip and jaw, and then runs forward. It extends outward, involving the angle and the exposed mucous surface to the line of growth of hair. In very bad cases these limits are exceeded, the gums, hard palate, and tongue being involved, and it may extend on the outside so far as to include the nose. By the extension of the disease it is not intended to convey the impression that this all arises from one or two ulcers. It is more likely that there will be a half dozen or more ulcers. In the beginning these ulcers are light colored, circular spots, considerably elevated above the healthy tissue. After they break down they become rough and irregular in shape and often cavernous, and two or more of them may run together. The deep tissues are involved as well as the superficial layers, and therefore the swelling is very marked, so much so that if the nose be involved breathing will be cut off through that organ or the lips will be so swollen that they can not suckle. The pig may therefore die from impaired breathing or from starvation. The ulceration progresses so rapidly that considerable pieces of tissue may die at once and drop off. In some cases reported the whole nose dropped off or large pieces from the upper or lower lip. In almost any case it is possible to pick off pieces as large as a pea or grain of corn. The disease is usually fatal in from three to ten days; occasionally a pig will recover with a much deformed nose or lip.

While the cause of this trouble has been ascribed to feverish milk from the mother, to poison obtained from the teats as a result of the sow coming in contact with poison vine, grass or weeds, and thereby carrying some irritating substance on the teats, that such views are very superficial it need only be shown that the disease occurs under conditions when

none of these factors are present. There is a bacterial disease of lambs very much like this disease of the pig, and there is a disease of grown animals also similar in character known to be due to disease germs. We have every reason to believe that this disease too is caused by a germ and that the pigs get it while nursing. The sow's udder being exposed to dirt and filth of every description could easily become the carrier. In fact, some observers assert that swellings and vesicles are seen upon the mammae before the pig's mouth becomes affected.

Treatment.—The treatment should be based upon the assumption of an infectious disease. If any evidence of trouble should occur, the sow and pigs should be moved to clean quarters. The pigs should be isolated from all other little pigs, as they may carry the infection. The medicinal treatment should consist in applying crude creolin preparations thoroughly to all the diseased parts and washing the sow's udder. This will usually be sufficient, and from three to six applications will suffice. There is little danger in using the creolin preparations and they are cheap. A two per cent. carbolic acid solution may be used in the same manner. Permanganate of potash, about a teaspoonful to the pint of water, is also good. If taken early and treated as directed above little loss need follow.

BLACK TEETH.

This condition is frequently brought to the attention of the veterinarian, but as yet we have no satisfactory explanation to offer for their presence. They are also found in health, as we have observed in heads at the slaughter house. Undoubtedly too much stress has been laid upon this condition. We are not inclined to attribute any disease to this condition upon the present evidence. In very young pigs, where this condition is most frequently seen, there may be very long, sharp teeth present which it would be better to cut off. Dentition may also be taking place at that time and the black tooth may be a shell, and there may be irritation of the gums, causing the pig to hold the mouth open, to salivate and to refuse to eat.

DISEASED TEETH.

The hog eats all sorts of objects and cracks nuts, coal, gravel, etc., upon the teeth, so that when the hog becomes old he is almost sure to have a bad mouth. Hogs sold for stock purpose are seldom affected in this way. Boars sometimes have very long tusks.

The symptoms of some derangement of the teeth are pain upon grinding, holding the head to one side while eating, insufficient mastication, as seen in the half or whole grain passed, and inability to shell corn from the ear.

The treatment is to give largely ground or sloppy grain and pasture. Cut off with dentist's cutters all long tusks, but do not knock out with a punch or cold chisel, as the latter method is almost sure to fracture the jaw.

DISEASES OF THE STOMACH AND INTESTINES.

GASTRO-INTESTINAL DISEASES.

The intestinal tract is subject to a great many diseases, but it is not the intention here to go into details for each one. The causes of nearly all are much the same, the symptoms are so much alike that sometimes they can not be differentiated and the treatment does not differ materially. The different affections show their greatest differences upon post-mortem and in the pathological laboratory.

Gastro-enteritis or inflammation of the intestines is not an uncommon occurrence. The stomach may be affected alone or the intestines alone, or both together. Inflammation of the stomach can not be distinguished from that of the intestines, and vice versa, nor can either of them be separated from the inflammation of both parts by any set of symptoms. The causes of inflammation in either are the same, and are foreign bodies, as pieces of bone, bits of coal, glass, nails, gravel, etc., spoiled food, as rotted corn and musty grain; easily fermented food, as green corn; impaction, as with clay and hardened faeces; irritants, as lye, soap, washing powders, etc., and injuries from without.

People seem to think that because the hog has exceptional powers of digestion that he can eat anything and can take poisons with impunity. Such is not the case, and as a result the hog suffers from ignorant practices in feeding and in medication.

In inflammation of the stomach and bowels the lining membrane is the part involved in most cases. In severe attacks the muscular and outer layers may also be involved.

Symptoms. — The symptoms are vomiting, pain, squealing, unrest, champing and grinding the teeth, stamping the feet, rooting places to lie down and then getting up soon, fever, rapid breathing, dryness of the skin, thirst but no appetite. In stomach involvement there may be vomiting of blood and bile. In intestinal inflammation there is nearly always diarrhea, but the reverse condition may occur. If the offending matter is fermentive or obstructive there is bloating. In severe cases nervous symptoms are also developed; there will be frothing at the mouth, delirium and paralysis. There is no rule as to the duration of the affection; it may last only a short time or it may continue for a week or more. The usual course is about four days.

The post-mortem appearances in a case of gastro-enteritis are a congested condition of the mucous membrane, an abundance of flaky mucus in the tract, flakes and shreds hanging on the wall and in the cases due to strong chemicals complete erosion. The affected intestines are always darker than normal. The lymphatic glands are reddened and thickened and if due to some slow infection there may be follicular ulcers in the mucous membrane.

Treatment.—The treatment consists in the removal of the offending

material with the least irritation possible. This usually requires a purgative, and raw linseed oil or castor oil may be given—four ounces of the former or one ounce of the latter. Epsom salts, Glauber salts, or Rochelle salts in two-tablespoonful doses are more active and also more irritating. Calomel may be used if the case is not very urgent. The pain must be relieved with laudanum—a teaspoonful every hour until quiet. In the place of laudanum two grains of powdered opium may be administered. There are many other sedatives that may be used, but when these will not answer it is doubtful whether others will do any better. Use soap-suds injections, if necessary, to evacuate the bowels. Give the pig all the cold water it will drink, give no food of any kind, and when convalescence begins give sweet slops.

COLIC.

Colic is simply pain in the bowels without inflammation. The causes are the same as those producing inflammation. The symptoms are the great uneasiness, squealing, stamping, getting up and lying down, attempts to defecate and urinate and grinding of the teeth. The treatment is a good dose of laudanum. (Teaspoonful for 150 to 200 pound weight.)

INDIGESTION.

Indigestion may be due to a variety of causes, principally exposure, unsuitable food and worms. It is characterized by impaired appetite, the desire for unnatural food, as the excrement of chickens, chewing rotten wood, eating clay and dirt, brick, etc., rooting, excessive greediness and rapid eating, but without proper digestive powers. The treatment is to place the pigs in a pen and limit the quantity of food given for a time. Give a variety. Give access to salt, charcoal, and ashes, and give an ounce of the powdered sulphate of iron to each half bushel of the above mixture. Recovery will usually take place in a short time.

SCOURS, OR DIARRHEA.

Scours may occur at any time after birth, and we have cases developing so soon that it would seem as though the pigs were born with the affection.

Scours, or diarrhea, is a profuse and frequent discharge of faeces, and they are usually watery in consistency. While the pig is young and the discharges are whitish, gray, or clay-colored, the trouble is usually designated as scours, and when the pig becomes older it is then generally spoken of as diarrhea. This condition is present as a symptom in many other diseases.

When the disease occurs within the first few days after birth it is nearly always due to a feverish condition in the sow and affecting the pig through the milk. It may also be produced by a chilly, damp bed,

by getting out into the grass when too young, by fermented food, as slops and mouldy corn, affecting the mother's milk. When the pigs become old enough to eat and drink it is nearly always due to the feed, as old table slops and sour milk, green corn in the fall of the year and spoiled, mouldy, and rat-soiled corn. It is the exception to raise swill-fed pigs without experiencing this trouble. We also have outbreaks that would seem to indicate that the trouble might be due to a germ, and that the affection might be infectious.

Symptoms.—The symptoms of the trouble are loose evacuations, which become more and more watery. In little pigs these are of a decidedly gray color and adhere to the tail and to different parts of the body. The appetite may be good at the beginning, but as the pig becomes decidedly feverish the appetite is lost. The back becomes arched; the flanks hollow. the hair rough, and there is indisposition to move about much.

Treatment.—Scours, being a disease largely due to bad dietetics and hygiene, must have as a foundation for treatment the correction of these errors. The sow should be in the farrowing pen for a week prior to farrowing; she should be fed lightly on easily digested food. Very little corn should be given. No active purgatives should be administered, but a little mild laxative, as oil meal, has an excellent effect. Charcoal, salt, and wood ashes should be accessible. These measures will tend to prevent the feverish condition that brings on scours that is so fatal at birth.

For a few days after farrowing the feed should be light. If due to cold and wet quarters, these must be corrected. When the pigs become old enough to eat and drink they should be given sweet food. There is no doubt in the writer's mind but that the value of sour swill is greatly overestimated, and if it is fed diarrhea may be expected. Start pigs off on green corn gradually, using with it some dry feed.

In the treatment of the attack use dry feed and not much of it. More can be done by penning the pigs, giving pure well water and a mixture of bran, corn meal and oats, than by medicine. Theoretically, we should clear the bowels of the irritant first by a purgative, and then give a sedative. Practically, good results come from administering a tablespoonful of laudanum for each three hundred pounds of weight two or three times a day. For very small sucking pigs give three or four drops of laudanum on the tongue, or give a large dose to the sow. The addition of carbolic acid to the slop at the rate of a tablespoonful for each gallon is also advantageous.

CONSTIPATION.

Constipation is just the opposite condition from scours or diarrhea, and is characterized by a diminution in the number of evacuations or in the quantity during a day.

It is caused by dry feed, lack of water, fever or paralysis.

It is a condition that is not hard to correct as a rule. The changing

of food from dry grain to sloppy feed is usually sufficient. The addition of small quantities of oil meal to dry feed will tend to keep the bowels open. When medication is indicated Epsom, Rochelle or Glauber salts, one or two tablespoonfuls, calomel, one to ten grains, castor oil, two tablespoonfuls, or raw linseed oil, four ounces, will be all that is necessary.

OTHER DISEASES.

Other diseases of the abdominal organs are inflammation of the peritoneum, or peritonitis. It is an inflammation of the membrane surrounding the intestines and lining the cavity. The causes are exposure, cold, extension of inflammation from other structures, and injuries, as in spaying, castration, etc. It is difficult to distinguish from gastro-enteritis from the symptoms. The treatment consists in letting the animal alone.

Hepatitis, or inflammation of the liver, may sometimes be diagnosed by the jaundice (yellow color of the eyes and lips). The treatment is the administration of calomel, one to five grains, and repeat every other day.

Nephritis, or inflammation of the kidneys, is seldom present except as a complication of some other disease, and is rarely recognized. The cases usually called inflammation of the kidneys are nearly always due to paralysis.

EFFECTS OF MEAT BRINE.

It sometimes happens that the brine from meat barrels is emptied where hogs gain access to it and it is eaten. Salt in small quantities is highly beneficial, but if taken in large quantities it causes a most intense gastritis. Hogs will not eat salt to excess if they have access to it all the time, but will if received only occasionally. The meaty taste probably adds to their desire for this particular kind.

Symptoms.—The symptoms of salt or brine poisoning develop in a short time after the eating. At first there is great restlessness, getting up and lying down, running from first one place to another, evidence of pain by the stamping of the feet and the crying squeal. Vomiting nearly always occurs, and diarrhea, with profuse watery stools will come on if the hog lives long enough. When the animal stands the breathing will be very short. The posterior parts will become paralyzed and he will drag himself from place to place. There will be convulsions (fits), during which the body will be thrown about with great violence, and there will be frothing at the mouth. These convulsions usually are of short duration, but the interval between them becomes shorter and shorter as death approaches. If the animal is discovered for the first time during the convulsions the case may be mistaken by the laity for rabies. The duration of the attack may be from a couple of hours to three or four days.

Upon post-mortem we find the mucous membrane of the stomach and intestines will loosen in great masses and there is intense congestion of the tract and peritoneum in contact with it.

Treatment is seldom successful. Give all the water the animal will drink and raw linseed oil—a half pint. A tablespoonful of laudanum will quiet the pain.

EFFECTS OF WASHING POWDERS.

It is a common practice to save the dish water as slop for hogs. People living near towns and cities consider the slops from restaurants and hotels a very cheap food and haul it away by the barrel or tank. The use of these slops is not as important a factor in pork production in this and other central and western States as in the East, but is being utilized more and more each year. Hogs fed upon such slops often sicken and die, the symptoms and course of the disease being very much like cholera. In 1897 Dr. Moore investigated and described the trouble, and the post-mortem appearances. By experiments he determined the cause to be due to the alkali of the washing powders in the dish water.

Symptoms.—The symptoms of the affection are diarrhea, vomiting, fever, lameness, partial paralysis, nervous disturbance and death of the majority of those attacked. The disease was not contagious in any case, and the course would run from a few hours to a few days—apparently depending upon the quantity of alkali ingested at one time. Upon post-mortem examination the lymphatic glands along the bowel were found to be swollen and dark colored. The mucous membrane lining the intestine was pale and slimy. The liver and kidneys were only occasionally affected, and the brain was congested in those showing marked nervous disturbance. The lungs contained areas of collapse in some cases. Attempts to inoculate the disease into other animals failed. An examination of the slops determined the presence of large amounts of alkalies, and three experiments made upon well hogs by feeding known amounts of the washing compounds developed typical cases.

The trouble has been referred to quite often in swine breeders' journals in the past three years. The writer has seen two such outbreaks. The remedy is plain—do not feed water containing alkalies.

EFFECT OF COTTON SEED.

While cotton seed finds no particular usage as a food for hogs, in this State, it is largely used in the South. It has a very high feeding value, but when continued for a long time it will cause death. This fatal result follows, no matter whether the seed is given raw, ground, roasted, boiled, or as droppings from cattle. The first evil effects of cotton seed are noticed from six to eight weeks after using the raw or ground seed and a longer time for the roasted or boiled, but is not always

observed after feeding cattle. The cause of the trouble has not been discovered, all attempts at getting an active extract having proven unsuccessful, and post-mortem examinations failed to show any effects that might be attributed to the hulls.

Symptoms.—The symptoms vary somewhat with the different animals. In the majority of cases the animals are found dead in their pens in from ten to twelve hours after they had apparently been in the best of health. In the cases which have been observed throughout the whole course there is first a moping dullness, staggering gait, labored breathing, spasmodic in character, or generally called thumps, loss of sight, restlessness, walking slowly in a circle and running into obstructions, lying down flat upon the belly—not upon the side—sudden exhaustion and death. The post-mortems thus far reported give no definite lesions.

WHEAT AND BARLEY BEARD.

It not infrequently happens that after hogs have been turned upon wheat or barley stubble that some will die. The symptoms which the pigs will present are quite variable. In some cases it will be an intensely sore mouth, in others it will be those of general bowel disturbance, and in a third it will be those of loud and difficult breathing. The writer has post-mortemed many such cases and found accumulations of beards in the mouth, stomach, or windpipe. A roll of beards may form and get down by the side or at the root of the tongue and penetrate the mucous membrane. The animal can not get rid of them; the parts become intensely swollen and inflamed, interfering with eating, and starvation will occur. Plugs of the beards may lodge at any point between the larynx and bronchi—producing loud, distressing breathing and coughing. The foreign body can not be removed and death takes place from suffocation. In the stomach the beards may puncture the walls. The injury may be so slight as to cause only a mild inflammation and interference with the appetite for a short time, until the beards become softened and pass on, or the inflammation may be so severe as to cause death.

The trouble is one that is not amenable to treatment except in those cases in which the beard is in the mouth.

EFFECTS OF COCKLE-BURRS.

Numerous articles have appeared in the swine breeders' journals and agricultural papers indicating that young cockle-burrs were poisonous to hogs and calves. While the cockle-burr is young and only three or four inches high it is very fleshy and tender, and relished by stock. The claims of poisoning of stock attracted sufficient attention that the Indiana Experiment Station made a chemical examination and a feeding test to determine the poisonous properties, but in both the results

were negative. The young plants, stripped of the burrs, were fed to calves, pigs, rabbits and guinea pigs. These were allowed all they would eat. In no case was any untoward effect noticed. We have been called upon to post-mortem some animals claimed to have died from such poisoning, and in all cases death was due to the burrs. A few burrs would be swallowed with the young plants, and their horny prickles would irritate the stomach wall and cause inflammation, which finally terminated in death. In three cases the burrs lodged in the throat and could not be expelled.

INTESTINAL PARASITES.

THORN-HEADED WORM.

The thorn-headed worm is the largest of the several species that infest the pig. The technical name is *Echinorhynchus gigas*. The worm is cylindrical and larger at the head end than at the tail. The females are from five to eight inches in length and the males from one and one-half to two and one-half inches. The female is about the same diameter as a lead pencil, will not fully straighten out, but remains partly coiled. The body is crossed by striae or wrinkles. The head is on a short proboscis and is surrounded by five or six rows of hooks. The color is white or sometimes tinged with pink or green.

The home of this worm is in the small intestine, particularly toward the stomach end. They are migratory and sometimes find their way into the stomach and are expelled by vomiting. It is rare to find them in the large intestine. We usually find them tightly attached to the intestinal wall, and so firm is their grip that they can not be removed without tearing either the worm or the intestine. The hooklets penetrate the mucous membrane and in some cases the muscular coat. It is reported that they may perforate the intestine and be found in the abdominal cavity. This last occurrence must be quite rare, as the writer has made a large number of autopsies without observing such condition. The small intestine may be greatly scarred by the punctures of the mucous and muscular coats.

The worm lays eggs that are passed with the faeces, and they have an interesting history. They become mixed with the manure and are eaten by the grub worm in the dung hill or pasture. Here the egg hatches and burrows its way outside of the intestinal tract of the grub and may live for a considerable time, even until after the grub has undergone its transformation into the June bug. The hog eating these grubs or June bugs sets free this parasite and thus becomes affected. Hogs are not generally affected with the parasite, but those pasturing upon clover or a very old meadow are more liable to be affected than those kept under other conditions. Every hog raised upon some farms may be affected by

from one to a dozen or more of these parasites, while other hogs in the neighborhood may be comparatively free. Some seasons in which we find great numbers of grubs we may have the hogs quite generally affected. This was true for 1896, when the loss upon sausage casings alone due to this cause resulted in a loss of about \$7,000 to the business of a single packing house.

Symptoms.—The symptoms as described by observers are loss of appetite, constipation, diarrhea, restlessness, general emaciation, weakness of the loins, stiffness of the hind quarters, and in young pigs convulsions and spasms. The majority of cases present no symptoms at all and the worms are only found at slaughtering. In other cases the pigs have depraved appetites and are hard feeders. In only a few instances are the worms found in the vomitus.

Treatment.—The treatment should be the administration of worm-seed and areca nut, or turpentine in milk, followed by a good physic. The pigs should be kept in a pen over night and not permitted to have supper; the next morning they may be given each one teaspoonful of a mixture of equal parts of powdered worm-seed and areca nut. This may be administered by mixing with a little cornmeal. To this may also be added one grain of calomel to act as a purgative. Salts make a better purgative, but can not be given so readily. The turpentine may be given one teaspoonful for each one hundred pounds of weight, and is best administered in milk. This should likewise be followed by a purgative. The fast should continue for from four to six hours after the medication. Gasoline might be tried in place of the turpentine and in the same manner.

THE LUMBRICOID WORM.

The large round worm is known as *Ascaris suilla*, or lumbricoid worm. This worm is said by some authorities to be rare, but it is more common in this State than the thorn-headed worm. The large round worm is from five to seven inches in length for the female and from three to four inches in length for the male. It is milky white and the body smooth. The head is small. It is an inhabitant of the small intestine, but is migratory and may get into the stomach or pass out of the rectum. It lays eggs and these pass out of the body with the faeces and after a time undergo changes and are probably taken in with the water or while rooting in the mud. The worms irritate the intestine by their biting.

Symptoms.—The symptoms of this parasite may amount to nothing in some cases, or in other pigs it may be a depraved appetite as to the character of the food or in the quantity consumed. Some pigs will eat an enormous amount and still remain poor. In others there are symptoms of pain as indicated by restlessness, and they may become cross. In a few autopsies it has seemed as though they had caused obstruction.

Treatment.—The treatment is the same as for the thorn-headed worm.

PIN WORM—*Oesophagostoma Dentatum*.

This small worm inhabits the caecum and colon of the hog and is very small. The male is only from one-fourth to a half inch in length, and the female a half inch in length. They are white or brownish in color, straight and pointed at both ends. The worms in all probability find entrance by the drinking water, and may be present in large numbers without causing recognizable symptoms.

WHIP WORM—*Trichocephalus Crenatus*.

This is the worm so commonly seen in the large intestine. The worm is small, being about one and a half inches long, fairly stout at one end and tapering to a point at the other. The worm produces eggs that may hatch in the intestine and become an adult in about four weeks. All pigs are more or less affected, and it is probable that the method of infection is through the water. No serious trouble has been attributed to them. A soapsuds injection is the best treatment.

KIDNEY WORM.

While the swine breeder is inclined to attribute many cases of weak back and paralysis to kidney worm, we can not believe that this parasite is the cause of many such cases. The worm is not often found upon post-mortem, and in the hogs in which it is found rarely showed symptoms of serious import.

The kidney worm is *Stephanurus dentatus*. The male is from three-fourths to one and a fourth inches long, and the female from one and a fourth to one and a half inches long. The worm is pointed at both ends and the mouth has six teeth.

The worm is also found in other parts of the abdominal cavity. As medicines can not reach them, there is no use wasting either time or medicine in treatment.

HYTADIDS, OR BLADDER WORMS.

It is not uncommon upon butchering or upon autopsy to find the liver or some other organ studded with small cysts or bladder-like formations. These contain the so-called bladder worms (*Echinococcus polymorphus*) and are the cystic state of the tape-worm of the dog (*Taenia echinococcus*).

The segments of the tapeworm are passed from the dog and fall upon the pasture or some other accessible place and are taken in with the food or drink by the hog. The segments contain hundreds of eggs and are very resistive to drying, so that the hog may become infected months after they are passed. When the segments reach the stomach or intestine the outer portion is digested and permits the eggs to escape. The young bladder worms soon begin to migrate, and the liver is the special point of

attack. The lungs, kidneys, muscles, and even the brain may be attacked. The bladders form very slowly and cause considerable enlargement of the organ. The liver may be increased to ten or twenty times its normal size. The lungs will become more solid. The bladders consist of a fairly stout membrane and contain a watery fluid. The mother reproduces and causes daughter cells, and these in turn reproduce, so that there will be several parasites inside of one cyst. The cysts may vary from the size of a grain of wheat to the size of an egg. They may occur inside an organ as well as on the outside.

Usually there are no distinguishing symptoms by which the case may be diagnosed during life. The symptoms present are not different from that of other diseases. When the brain is affected the head is carried twisted and to one side, later gradually developing paralysis on one side, and finally profound nervous symptoms.

There is no treatment for affected animals. It can be prevented by keeping dogs away.

The affected organs of a carcass should not be used under any circumstances, and a close inspection be made of all other parts to determine their presence.

MEASLES.

Measles in the pig have no resemblance nor any relation to that disease in the human. Measles in the pig is a parasitic disease due to the *Cysticercus cellulosae*, the larval form of the *Taenia solium* or tapeworm in man.

The cause of the disease is the eating of human excrement which contains segments of the tape-worm. Hogs finding excrement about barns or pens, or having access to privies may become infected. The disease is of very rare occurrence in this country, compared with other countries, as people are seldom affected and more care is exercised in preventing hogs gaining access to faecal deposits. This is one of the diseases which government inspectors constantly search for, as the eating of measly pork, if not well cooked, will result in the development of the tapeworm in the human.

The tape worm segments, when they reach the hog's intestines, are digested and liberate the thousands of eggs, and these begin to develop and to migrate from the intestine to all parts of the body—the intestines, diaphragm muscles, and even the skin may be invaded. They produce small cysts from the size of a grain of sand to that of a millet seed. It is not known how long they can live in this condition, but it seems probable that it may be for years.

Symptoms.—There are no symptoms produced which are especially characteristic of this disease. Many hogs never show any ill health as a result of infection, and those that do, present symptoms that might more readily be mistaken for some other affection. The symptoms as usually

described are a hoarse voice, falling out of the hair, depression, general weakness, inappetency, paleness of the buccal membrane, anaemia (bloodlessness), emaciation (starvation), oedema (swelling) of the head, neck and shoulders, etc., diarrhea, general paresis (paralysis) or local paralysis. The diagnosis is made when the nodules appear on the eye lids inside of the cheek, lips and alongside of the tongue.

Ordinarily the disease is only recognized after death, as the parasites appear as small granules in the tissues, and the microscope is necessary to reveal the head, hooks, etc.

Such meat should not be used for food. There is no treatment.

TRICHINA.

While we have no means of diagnosing cause of trichina in the pig before it is killed, we are still under the necessity of calling attention to a disease that necessitates an expenditure of several million dollars for the inspection of pork in order that our meat products may be admitted into foreign countries. The disease is not of any considerable importance because of any serious disturbance to the pig, but because it may, under favorable circumstances, be communicated to people. The danger in this country, where it is the practice to properly cook meat, is very small and is greatly overestimated. There are only a few cases of death reported in this State as caused in this manner.

The trichina is a small worm, and exists in two states—an active, reproductive state in the intestines, and an encysted state in the muscles. In both states they are too small to be detected with the naked eye. The development of the case of trichina when it starts with a piece of meat is as follows. The encysted trichinae taken into the stomach with food become free in about twenty-four hours, in from twenty-four to forty-eight hours they begin to breed, and in a few days immense numbers of living embryos appear. It is estimated that a single female produces 1,500 eggs. The life of the parasites here is about five or six weeks. At the end of about seven days the parasites begin to migrate from the intestines to the muscles. This continues to the third week. It requires from three weeks to three months for the trichina to find a suitable resting place in the muscles and to become encysted. Then comes the resting period, during which the worm becomes coiled upon itself and surrounded with a lime deposit, and here it may live for years.

The trichina is probably spread in a herd by the pigs eating food soiled by the droppings of other hogs, by eating mice, rats and other rodents, and by eating the offal from slaughter houses. Mice and rats are quite frequently affected, and hogs that eat the offal from the slaughter house are much more frequently affected than those not so fattened, showing that they must have contracted the trouble from this source.

The places at which we find the infection in greatest abundance is in the diaphragm and the tenderloin. The hams and shoulders, too, become affected in bad cases. Young hogs, eight or nine months old, are seldom affected. Hogs kept until they have become two or three years or older are the principal victims.

Symptoms.—The symptoms of the disease observed in experimental animals are lessened appetite, arching of the back and persistent diarrhea for a week or two during the intestinal stage and a little later during the muscular invasion an intense itching. These correspond to the conditions found in the human subject.

There is no treatment either in the lower animals or in man, and we must depend wholly upon preventive measures. The preventive measures consist in destroying all rats that infest the premises, and not to feed the refuse from the slaughter house. Also to turn the hogs off to market while young.

Trichinous pork, when found in the packing houses, is not condemned as waste, but is cooked thoroughly for three hours which insures the destruction of the parasites, and the product is sold as cooked meat.

RESPIRATORY DISEASES.

The respiratory diseases of the hog are the same as occur in other animals, as coryza, or inflammation of the nose, commonly called sneezing, pharyngitis, laryngitis or sore throat, bronchitis or cold, pneumonia or lung fever, and pleurisy. It is much easier for the veterinarian to make these and other distinctions in describing the diseases than it is for the owner to recognize them. Broadly speaking, these diseases are nearly all due to the same causes, and the hygienic treatment is so nearly alike in all that no attempt will be made to go into the details of each.

The causes of respiratory troubles are nearly always bad hygienic conditions. First, exposure to cold, rain, snow, mud and wind, lack of shelter and a damp bed. The repeated chilling of the surface of the body results in congestion and inflammation of the internal organs, and naturally the respiratory organs suffer most. Second, the overcrowding of pigs in pens, so that the under pigs become overheated and thus contract colds easily. Third, the use of the manure pile as a bed. The heat from the fermenting heap not only heats the body, but the gases generated are poisonous and irritating to the air passages. Fourth, the inhalation of dust also has a bad effect in producing irritation and cough. Fifth, the use of cold springs and creeks as wallows. Hogs that have the range of a pasture in the hot sun become much heated and if allowed access to cold water are sure to be chilled and contract cold, pneumonia or pleurisy. Sixth, other diseases may affect the respiratory organs as rachitis may affect the nose, foreign bodies may affect the

throat, parasites may cause bronchitis and pneumonia, and hog cholera may be complicated by pneumonia and pleurisy.

CORYZA.

In coryza the first symptom is dryness of the nostrils and frequent sneezing. The dry stage lasts for about one day and is succeeded by a moist stage during which there is a profuse, watery discharge. This continues about four days and recovery takes place. Medication is unnecessary.

CATARRH.

Catarrh is like coryza in the early stage, but the disease tends to involve deeper structures and to extend to other parts. The discharge becomes thick and whitish or yellowish and purulent. The surface of the membrane becomes more or less ulcerative. Sometimes we have very severe outbreaks known as malignant catarrh. The disease does not run any well defined course.

SORE THROAT.

Sore throat is nearly always secondary to nasal trouble. It may assume the form of swelling of the glands of the neck and is known as quinsy. The swelling may become so great as to cause death by suffocation. The symptoms are distressed, noisy breathing and a greatly swollen throat. In sore throat proper there is inflammation of the pharynx and larynx, but the neck is either not swollen or only slightly so. There is a dry, hard, throaty cough, often quite hoarse, ordinarily spasmodic in character, but when through the coughing does not seem to give relief. The breathing is rough and noisy. There is much difficulty in swallowing food or water. There is some fever and loss of appetite, but the refusal to eat may be due to the difficulty in swallowing. There is considerable restlessness. The disease may develop rapidly and the air passages be closed in a few hours, or the disease may run a course of a week or more and then make a recovery. The usual course is about four days.

BRONCHITIS.

Bronchitis is generally what is meant when speaking of coughs and colds. It is an inflammation of the trachea and bronchial tubes. The prominent symptoms are the cough and some little distress in breathing. There is usually a little fever at some stage and but little impairment of appetite, although the pig will not be thrifty. The coughing may take place at any time, but is especially prone to occur upon leaving the bed, after eating and after exercise. A little dust will greatly aggravate it. Pigs seldom die of this affection, but fail to grow properly. The disease does not run a definite course, but keeps up as long as the exciting cause

is present. An attack may continue through a winter, or through a summer season if it should be dry and dusty.

PNEUMONIA.

Pneumonia is an inflammation of the lung tissue and is probably more fatal to the hog than any other class of animals. It begins as a chill and is attended with high fever. The breathing is short and quick, a distinguishing feature from the diseases already mentioned. There is coughing and sometimes nose bleeding. The hog will lie down all the time unless made to move, and exercise brings on exhaustion and sometimes death. The cough at first is deep and dry, but afterwards is moist and brings up much mucus. The appetite remains only fair, but emaciation follows quickly. The attack runs a course of from ten days to three weeks, and in fat hogs is almost always fatal. Hogs that are thin in flesh have a good chance for recovery. The disease may involve only one lung or parts of both.

PLEURISY.

This is a much more common affection than is generally suspected. It is an inflammation of the membrane covering the lungs and lining the chest cavity. The outset of this affection is seldom observed, and when discovered the symptoms are those of pain. The breathing is characteristic, the breath is short and jerky, the ribs are held rigid, and there is the large movement of the flank often ending in a quick jerk, as in thumps. There is a cough, but it is cut off suddenly as if suppressed. There is sometimes lameness in one or the other of the fore legs. The appetite is fair and the general appearance may be good. The attack runs its course in from about nine days to two weeks.

A post-mortem in a case of bronchitis would show a reddened, inflamed trachea and larger and smaller bronchial tubes, with more or less frothy mucus, but the organ will float. In pneumonia the lung substance will be found to be involved and the affected area will be solid and liver like. The air spaces are completely filled. The inflammation may involve the whole of the right or left side, more often only a portion of either lobe and but rarely both lobes. Such a lung when placed in water, will not float. Sometimes abscesses form in the affected areas and may contain liquid or cheesy pus. In pleurisy there is thickening of the membrane covering the lungs or lining the ribs, adhesions between the lungs and ribs, and fluid in the chest.

COUGH.

A cough is not a disease of itself, but is a symptom of some disease. It is nature's method of getting rid of mucus and other foreign matter. It is a symptom in troubles in the throat, trachea, bronchi, lungs and pleura. It may be present in some heart diseases, and may also be

due to a constantly overfull stomach. It may be due to parasites. The cough should not be treated of itself but the cause producing it. A nervous cough, or a whooping cough has often been described in swine journals, but we are of the opinion that in the majority of cases, at any rate, this condition is due to parasites.

Treatment.—The treatment of respiratory diseases must be largely in care. The causes must be removed if possible, and unless these can be removed medicinal treatment will not avail. The feeding should be light and of an easily digestible character. The coryza and catarrh practically needs no treatment. In the sore throat, bronchitis, pneumonia and pleurisy, it is usually advisable to begin by emptying the bowels before they become constipated, and this can be done by a tablespoonful of epsom salts, or one to ten grains of calomel. In the absence of either of these an ounce of castor oil or four ounces of raw linseed oil may be used. To reduce the temperature and counteract the inflammation probably nothing acts better in the hog than aconite. The dose is from ten to fifteen drops of the tincture for each one hundred and fifty pounds. This may be repeated every four hours. In the sore throat, bronchitis and pleurisy, belladonna may be combined with it in the same quantity. Each case should be treated upon its own merits, and many remedies might be prescribed, but for a general treatment applicable to the great majority (nine-tenths) we can recommend nothing better than the above.

LUNG WORMS.

The pig is sometimes attacked by a parasite which affects the smaller bronchial tubes and gives rise to greater or less irritation and may be the cause of considerable loss. We have no means of knowing how prevalent the affection is or how much loss it occasions, as a sufficient number of observations have not been recorded to warrant drawing any conclusion. The writer is of the opinion, however, that the affection is far more prevalent than is generally suspected and that when it occurs at the beginning of winter it is liable to prove fatal.

The parasite which causes this trouble is called *Strongylus paradoxus*. The male is about three-fourths of an inch long and the female one and a fourth inches long. The worm is very slender and the color is whitish or brown. The worm lays a large number of eggs, but before these can hatch and develop into other mature worms it seems that it is necessary for the eggs to be expelled by coughing and undergo a part of their development outside of the body. Just what these changes are or how long it can live outside of the body is not known. We do know that the eggs of the species which inhabits the sheep may live for months in water and that they may be dried upon hay for a year and then placed in moisture and they will develop. It is probable that these parasites live under similar conditions. The pig in all probability becomes in-

fects while drinking surface water or rooting in the mud. The favorite point of attack of the lung worm is the bronchi at the apex or forward lobe but they may involve any portion. Their presence acts as a foreign body to cause irritation, thus exciting profuse secretion and consequently requiring coughing to relieve the parts. The bronchial tube becomes more or less thickened or tumefied, and at different points there will be nodules containing the parasites. In some cases the effect is to enlarge the bronchi or to cause sacculations. The inflammation may extend from the bronchi to the lung tissue and cause small patches of pneumonia. The tissue may break down, become encapsuled and later we have a cheesy mass as a remnant. In an affected lung we may find small tubercles throughout its substance due to the encystment of eggs and debris. These are probably drawn into their final resting place in the lung tissue during an act of inspiration and then remain fixed, and sometimes are called tuberculous at a careless post-mortem.

The Symptoms.—The trouble is largely confined to pigs, as the mature hog will show little effect of the lung worm. The first symptoms begin as a cough, occurring upon leaving the bed, after exercise and after eating. The appetite in the early stages and in mild cases is not impaired. The cough may be more frequent and persistent and is generally denominated chronic. In badly infected cases the paroxysm of coughing is quite severe, beginning slowly, becoming harder and harder, and finally, the pig will put the nose on the ground and press hard while coughing. The paroxysm ends by the expulsion of a clot of mucus or vomiting. This is referred to frequently in the journals as whooping cough in the pig. If the disease occurs late in the fall or early in the spring while the conditions are favorable for an easy development of pneumonia, this complication often ensues and causes death. In many instances the pigs lose flesh and become very poor. The disease occurs as an epidemic in a herd and therefore is generally reported as swine plague. Swine plague, however, is a disease of short duration and attacks older hogs.

Treatment.—The treatment consists in the removal of the pigs from the infected pasture and the giving of pure water. The old hogs need not be moved. The treatment of the attack itself simply consists in the supplying of nutritious food and waiting until age shall give the necessary resistance to overcome the attack. Medication is of little value, although all sorts of fumigations have been recommended. A fumigation of tar or turpentine may be tried if desired.

SNIFFLS—SNUFFLES—BULLNOSE.

It is evident from the descriptions given that all writers are not agreed upon the nature of this affection. There are two varieties of the affection—the catarrhal and the rachitic.

In the catarrhal form we have a more or less wheezing, respiration

occurring at irregular intervals. There is a profuse, watery discharge from the nostrils, causing the animal to blow violently when first getting out of bed or after eating. The animal can not exercise freely owing to the difficult respiration. The attacks, which are mild and of intermittent character at first, become more severe and the condition is persistent. The discharge changes from a thin, watery secretion to one containing blood, to thick mucus, and finally yellowish or purulent. Nose bleeding is frequent owing to the violent efforts to clear the nose. There is a cough, the eyes become red and the tears flow, the hair roughens and the whole appearance is "dumpish." There is difficulty in seizing, grinding and swallowing the food, owing to the soreness of the mouth and throat. The trouble runs a course of from one to five weeks and death comes from starvation or asphyxia. Those that recover nearly always remain stunted.

A post-mortem examination of such a case shows the mucous membrane lining the nasal chambers to be greatly thickened, practically blocking the air passages. The turbinates and the septum become so crowded by the uneven pressure that they are deformed. The effect is to produce a blunt, thickened, more or less twisted nose, depending upon the uneven changes in the different bones.

In the rachitic form we have essentially the same changes take place in the nose, and in addition there are changes in the bones in other parts of the body. The legs become curved and misshapen, and often there is breaking down on the feet. Not infrequently, too, there will be bulging of the bones of the head, as in hydrocephalus.

The cause of the trouble is not definitely known. By some all the cases are regarded as being primarily due to a lack of development of the bones in the nose, thus predisposing to catarrhal trouble. Others consider that the trouble may be catarrhal from the beginning, due to catching cold, and that the changes in the bones are secondary. The writer is of the opinion that some cases belong to one class and some to the other.

The disease is sometimes described as being contagious, but we are not in possession of facts to justify such a statement. It is more probable that the conditions which give rise to the trouble in one pig may also affect others. It is frequently observed to affect all the pigs belonging to one litter, but I have never witnessed the trouble pass from the pigs of one litter to pigs of another. It has also been observed in four successive litters from the same mother, thus showing a hereditary tendency. There were also other evidences of rickets present.

We find this trouble in pigs kept under good hygienic conditions as well as in those that are subject to exposure and poorly nourished, and it is more common in those breeds with stubby, turned-up noses than of the straight variety.

Treatment.—The best treatment is to destroy such pigs. It will end their misery and save expense. The majority will die and those that

recover will not be worth feeding in nine cases out of ten. Those who wish to try to save them should put the pigs upon a good pasture and feed sweet milk. Corn should not be given, or, if it be given, there should be oil meal added to balance the ration. If pasture can not be secured, provide a dry, warm pen. Keep the bowels open as the symptoms may indicate. Fumigate with burning tar and apply tar about the feed troughs. An ointment composed of equal parts turpentine, kerosene and ammonia in sufficient lard to make it stiff has been recommended as an application to the face. This is repeated twice a week for a month.

DISEASES OF THE SKIN.

LICE.

The hog louse (*Haematopium urius*) is the largest member of the louse family. It has a very large, elongate oval body, with a long, narrow rounded head. The head and body are yellowish gray, with brownish spots, giving the whole a rusty appearance. The legs are quite strong and the fellow is capable of moving about with considerable rapidity. The favorite points of attack are along the lower part of the neck, under and behind the fore legs, and on the belly. They may be found on any part of the body. The eggs are large and white in color until soiled and are attached to the hair. As far as known the hog louse lives only a short time and does not reproduce off of the body of the hog. It is not produced by bad food or a poorly nourished body, but is conveyed from one animal to another. Some herds may be entirely exempt from the parasite, while others may be greatly annoyed. The louse is a serious handicap to growing pigs, for when they are present in large numbers they irritate the skin and cause such itching as to interfere with the appetite and general nutrition so that the animal may become very poor.

Treatment.—The louse is easily killed and at little expense. The method to pursue should depend in part upon the number of hogs to be treated. Kerosene or coal oil is a good agent and will answer very well when only a few are to be treated. The hogs may be sprinkled or the beds sprinkled with a spraying apparatus or watering pot. As all parts can not be reached easily by this method, the operation must be repeated. An ingenious method of applying the oil is by means of the rubbing post. A good solid oak post a foot or a foot and a half in height is placed in position in the hog lot. One hole is bored in the top to a depth of about eight inches and two at right angles from the sides at the bottom of the vertical hole. Soft pine pins are driven in the side holes. The upright hole is filled with kerosene and stoppered. Next a burlap strip eight or ten inches wide is wrapped around the post over the side plugs. This after a little time becomes soaked with kerosene and the pigs will rub against it at the place where it will do the most good.

If a large number of hogs are to be treated then crude petroleum is the cheapest material and may be sprayed on or still more effectively applied by the dip. A sheep dipping vat is sunk into the ground and a false bottom placed in the vat so that it will not be over three feet deep. The vat is then filled with water to the desired depth and about an inch of the crude oil poured on top. The hogs may then be driven through and a thin layer of oil will be deposited on every point. We have used this at a number of places and dipped two hundred hogs per hour at a cost of one-tenth of a cent per head for material.

The sheep dips that resemble crude creolin may be used in the same manner. These are Zennoleum, chloronaptholeum, milk-oil, creosote, Daytholeum, cresa alba, taroleum, etc.

When pigs only a few weeks old are to be dipped they may be caught and immersed in a barrel. There is no doubt but that the destruction of lice on hogs gives better returns for the money expended than any other medication.

MANGE.

This affection of the pig is quite frequently alluded to in journals devoted to the swine industry and is described in nearly every work upon swine. It must be a rare affection, however, as in the eight years which the writer has given attention to the diseases of swine he has never seen a case.

Mange is caused by a parasite (*Sarcoptes scabiei*, var. *suis*), which is much smaller than the louse and makes its home just beneath the outer layer of the skin. It begins with a violent itching about the head, especially at the base of the ears, about the eyes and gradually extends to the neck, withers, croup, inner surface of the thighs, and whole body. At first the skin is red and there may be small blisters or abrasions from rubbing. A little later the cuticle begins to rise and loosen and the affected regions look gray. These become astonishingly thick, the skin becomes deeply wrinkled, the hairs loosen and mat together. In an old case the animal looks as though he had been whitewashed several times and gotten dirty.

The scab parasite lives underneath the surface of the skin, multiplies rapidly and the irritation produced causes this immense scurf. The parasite can not be communicated to other animals and live more than one generation.

Treatment.—The treatment consists in a good scrubbing with soap and the application of sulphur or nitrate of lead ointment. The creolin dip may also be used.

URTICARIA. NETTLE RASH. SURFEIT.

This affection is marked by the more or less sudden appearance of blotches on the skin and these may disappear as suddenly as they came. These are usually accompanied by digestive disturbances and fever.

Symptoms.—The onset is without warning, usually coming on in a night. The upper part of the body is the part most likely to be affected. These blotches are dark in color, about the size of the finger-nail, but they may be so thick as to run together and be as large as saucers. Pustules form of variable size. The skin is very itchy and the hog will scratch upon any convenient object. The surface may thus be abraded and aggravate the case. In the light cases the trouble will pass off about the second day without any pustules forming. In the more severe cases large numbers of pustules form and it requires a week or more to make a recovery. The appetite is impaired and the bowels constipated at first, but become loose about the third day. The disease is not contagious. The cause is probably poor feeding, too heating food, wet skin and exposure.

Treatment.—Give two tablespoonfuls of salts and follow by giving ten drops of Fowler's solution of arsenic twice a day.

ECZEMA.

This is the scaly rash, scabby rash, or pitch mange. It is caused by exposure to extremes of heat or cold and to a filthy condition of the bedding. It is seen in weakly pigs. It may extend over the whole body. The disease starts by small red spots followed by a vesicle (blister), which in time becomes pustular. These dry up and form great, thick crusts which, as they become older, wear down and get lighter and more branny. All stages of the disease may be present at the same time. There is great itching at times. The treatment is simple. Wash with some creolin preparation and give a clean bed.

Granular eruption occurs upon the face, head, ears, back of the croup and base of the tail, which very much resembles the foregoing, but is not itchy. The treatment is the same.

Warts are simply piled up epidermal cells and are best removed with the knife. A preparation of a drachm of salicylic acid in an ounce of castor oil rubbed on once or twice a day for a couple of weeks is also good treatment.

We have no evidence as yet that the hog has such diseases as measles, diphtheria, and a number of other eruptive diseases that have been ascribed to him.

SORE TAILS.

While the pig's tail is of no great value from the butcher's or feeder's standpoint, it is desirable to retain this appendage for cosmetic effect in breeding animals. The cause of sore tails and tails dropping off in nine cases out of ten is a cold, damp, unclean bed. Associated with the trouble we frequently have a cracked and irritable skin, rough hair and an unthrifty condition.

Treatment.—The treatment divides itself into prevention and the cure of the attack. The first necessitates either a change in quarters or of the litter, thus securing a dry, clean bed. The sun is the greatest purifier and germ destroyer and should be brought to our assistance in these cases whenever it is possible to do so. Sunning the bedding is an excellent remedy. The treatment of the attack consists in the application of a little carbolic acid mixed with lard or vaseline. One part of carbolic acid to from ten to thirty parts of the lard or vaseline. Sore tails are readily amenable to treatment if taken in time.

DISEASES OF THE NERVOUS SYSTEM.

PARALYSIS.

Paralysis usually occurs in the mature animal, sows and fattening hogs, and, while it may occur in the pig, it is rare. It occurs most frequently in the winter and spring and is the affection commonly called kidney worm.

Cause.—The great cause of paralysis is too rapid fattening or an over-fat condition, in which process the cord is involved by pressure. It is very rare to find a case in a lean hog. Another cause is shipping hogs in crates. We have witnessed this condition a number of times upon the arrival of breeding hogs and at fairs if the hog had been in the crate for a long time. Sometimes the recipients of such hogs claim breeders have not sent sound hogs when they arrive in such condition. They may have left the premises of the shipper apparently all right. It is also due to lack of exercise, as seen in brood sows confined in small pens prior to farrowing. Some also claim that the trouble may be due to indigestion. It may be produced by an injury. If the kidney worm causes such trouble it must be rare, as in a great many kidneys sent for examination from such cases the worm was not found.

Symptoms.—Partial or complete paralysis may develop suddenly or come on gradually, and is nearly always confined to the hind quarters. It nearly always involves both sides of the body. When the disease develops slowly the first symptoms will be an unsteady gait, the hind legs not following exactly in line with the fore legs—instead of walking directly forward the body appears to go sidewise. There is not the usual ease in movement and the legs will strike on passing. There is more or less difficulty in getting up. These symptoms become progressively worse until the animal simply drags the hind parts.

In the cases in which the paralysis develops suddenly the pig is found in bed unable to get up on the hind legs.

The appetite is usually good in the early stage and may remain so, and if lost is due to the condition of the bowels from constipation. The

bowels become constipated to a greater or less extent, depending upon the amount of paralytic involvement. The animal, upon trying to move, will squeal, but the character of the squeal does not indicate pain. Pressure over the affected regions does not indicate pain. The case will drag along and oftentimes will make a recovery in from a few days to a couple of weeks. Others will die soon, owing to the paralytic condition of the bowels.

Treatment.—The treatment consists in removing the hog to a place where it can not be disturbed, to reduce the feed to a very small quantity and that given preferably in the form of a slop, in order to overcome the tendency to constipation. No corn should be given. The medicinal treatment consists in the administration of tincture of nux vomica, ten drops twice a day for a week or ten days. This will be found to be effective in most cases. The bowels should be kept open with small doses of calomel, one to five grains, castor oil or raw linseed oil, and iodide of potash may be given in twenty-grain doses, twice a day after the first week, to good advantage. Turn the hog over occasionally but do not try to force it to walk, as it will do so as soon as able. After recovery keep it away from other animals for two weeks.

CHOREA.

This affection is known as jerks in pigs. This affection may develop at any age, but is most commonly seen in the young and half-grown and particularly in those not well developed. It is common in pigs with a bulging forehead and otherwise showing a tendency toward hydrocephalus. The causes of this trouble are not definitely known, but are probably due to errors in development and excessive fattening at an early period and to lack of exercise.

Symptoms.—The disease is characterized by spasmodic movements of some part of the body, as the head or one or more legs. The head is most often affected and is jerked to one side and is sometimes accompanied by wry neck. The jerking may come in quick succession or there may be considerable intervals between the jerks. The attacks may be semi-spasmodic—that is, very bad part of the time and only moderately so at other times. The jerking takes place more or less constantly during the waking hours. If a leg be affected it will be drawn up and put down suddenly, keeping up the motion more or less constantly while standing. There will also be some twitching when lying down and not asleep.

Animals so affected may be in good condition when the trouble first develops, but often they become thin and puny. The best treatment is to turn such cases out on clover pasture, to give plenty of milk and little or no corn. As they get older they get better without medicinal treatment. Weakly pigs are hardly worth their keeping.

SUNSTROKE OR HEATSTROKE.

Hogs unprovided with shade in a pasture sometimes suffer sunstroke. Hogs driven upon a very hot day easily become overcome by heat and it is called heatstroke. The conditions in the two cases are the same.

The symptoms are fatigue, dropping of the ears, staggering gait sudden collapse and unconsciousness. Convulsions occur and as a rule death follows shortly.

Treatment.—Remove to a shady place, put cold water upon the head but not upon the body and give a teaspoonful of tincture of nux vomica.

APOPLEXY.

This affection occurs in pigs that are in a very fat condition and is due to a rupture of a blood vessel in the brain. This is usually brought on by exercise. The pig drops down suddenly and becomes unconscious and dies in a short time.

EPILEPSY — FITS.

This is commonly called fits, and the symptoms are sudden falling, frothing at the mouth, convulsive movements and then a gradual return to the normal. The hog may be eating at the time of a seizure and continue to chew the same mouthful of grain upon recovery. If the pig is in a herd with others and these seizures occur it is likely to be attacked during a seizure and killed.

The cause of these troubles is probably faulty development. Little can be done that is better than turning out upon pasture.

INFLAMMATION OF THE BRAIN AND ITS MEMBRANES.

While we know that there are three distinct diseases, inflammation of the outer membrane, inflammation of the middle and inner membrane, and inflammation of the brain substance, it is not easy to distinguish them in the pig.

The causes are high temperature, as in summer, unusual exercise, sudden changes in food, overfeeding, parasites and injuries.

The symptoms are excitement, restlessness, grinding and champing of the teeth, salivation, squealing and grunting, violence, but not directed as in rabies, convulsions, walking or running in a circle without much ability to dodge obstructions, pressing the head against the pen and holding it there, stupefaction, paralysis, and death. The course is short—twelve to thirty hours.

THUMPS.

This is an affection that starts in the very young pig, usually making its appearance at from two until six weeks old. It may also occur at a later period.

The nature of this disease has not been fully determined, some considering it a heart disease and others a nervous disease. The writer is inclined to the latter view and that it is due to spasm of the diaphragm, probably due to pressure.

Symptoms.—The symptom is the sudden jerking movement in the flank. When the pig is standing quietly the jerk is very noticeable and may be of such violence as to move the whole body backward and forward. It may be accompanied by a sound that may be heard some distance. These contractions are not rhythmical, but may be much more frequent at one time than at another. After exercise the jerking is more violent. The jerking is also more pronounced after a full meal than when the stomach is empty.

The causes are probably a full stomach and lack of exercise. The disease occurs in pigs that are farrowed at a season when they can not get out of their bed, in litters from mothers that are exceptionally heavy milkers, and always in the fattest, prettiest pig in the bunch. It never or rarely ever occurs in pigs that are farrowed out of doors in the field or woods, where they learn to follow the mother at once. The keeping of the stomach full of milk pressing upon the diaphragm and no exercise are the causes. After the disease once develops the pig loses the appetite to a certain extent and loses flesh, so that he may become very thin.

The thumps are often seen in pigs after an attack of pleurisy, in which the lungs and ribs become adherent to a greater or less extent.

Treatment.—The treatment requires an increase in the exercise. As soon as the first symptoms develop the pig should be picked out of its bed and placed in a barrel or box and kept there for an hour or two twice a day. If possible turn them out into a pasture. If they are kept in a pen give salts or castor oil. McIntosh recommends fifteen to twenty drops of each tincture of laudanum and digitalis every two hours until the animal is relieved, which is stated to be from twelve to eighteen hours.

DISEASES OF THE REPRODUCTIVE SYSTEM.

ABORTION.

Abortion or slipping of pigs sometimes is a troublesome problem with which to deal. There seem to be two varieties in these animals, the same as in the other domestic animals, sporadic and infectious. The sporadic form is the variety most often met with and is due to accidents, as slipping, falls, being kicked by a horse or hooked by a cow, by being run by dogs, or worried by other sows in heat, or by a boar, to spoiled or musty food, to "piling up" in bed, to sudden exposure to cold and to the effects of some other disease, as cholera. It can readily be observed that these causes will not as a rule act upon many sows in the same herd with sufficient violence to cause abortion, as the sow does not abort easily. After

an outbreak of cholera we expect a considerable percentage of abortion. While an infectious abortion of the sow has not been described, the Station has been the recipient of several accounts of such trouble that could not be accounted for upon any other hypothesis. In these cases a greater or less percentage of the herd would be affected, and, like barrenness, the trouble is much more frequent some seasons than at others.

Symptoms.—The symptoms of abortion when due to accidental causes are great uneasiness, shivering, making of a bed, violent straining and groaning. The parts are unprepared for the accident and therefore is associated with considerable pain and occupies several hours. If the abortion occurs within the first two months a discharge of blood and a macerated foetus and membrane are all that will be found. After two months the foetuses will be entire. In some cases there will be a loss of appetite and an indisposition to move about for a few days, while in others the disturbance is so slight as to be scarcely noticeable. In the infectious form of the disease the genital tract seems to be prepared and there is less disturbance than in normal labor and unless the swollen genitals and the expelled foetuses are seen the first warning of such an accident may be the recurrence of heat. Infectious abortions seem to occur most frequently at the end of the second month.

Very little can be done to arrest the act and without knowing the cause it is hard to prevent. It is a wise measure in all cases to remove aborting sows from the herd upon the assumption that it may be infectious and that the presence of such an animal may be a menace to others.

BARRENNESS.

Sterility may exist in either the male or female and may be temporary or permanent. Many animals said to be sterile are only so for a short time, due to conditions that will pass away.

Sterility may be due to faulty development of the generative organs. In the female the uterus may be abnormally small, the ovaries may be rudimentary or there may be imperforate vagina and os. In these cases the animal never comes in heat or never conceives. It is not worth the while to try to restore such cases when there is such an abundance of normal pigs. Sterility may result from excessive fattening. This may be due to occlusion of the passages due to pressure by fat, or the ovaries may become so infiltrated with fat as to cease being functional. In the former case the function can be restored by reducing the fat, but in the latter case the change is so great that nothing will insure a complete return to the normal. Such an animal may breed occasionally but is never sure. We find these two conditions in hogs quite often after they have been fitted for the fair circuit or even for a show sale. A very fat condition, even if it should not cause barrenness, is detrimental to large litters, and the pigs when born are likely to be weak.

Barrenness may be due to a rigid os, thus preventing the entrance of the seminal fluid. Such a condition may be found in sows the first time or when they become old. Such a condition may be overcome quite easily by means of a dilator.

Barrenness is also due to an inflammation of the lining membrane of the uterus. This is likely to occur after an abortion and also to follow such diseases as cholera. There is very little to aid one in recognizing this condition. The sow usually comes in heat, but fails to catch. Sometimes a discharge will be seen. In valuable animals a veterinarian should be called to make a curetment.

Barrenness also comes from old age.

Fecundity, or the number produced at each birth, is dependent upon the individual.

Barrenness in the male is due to improper development of the sexual organs, to fatty infiltration or degeneration of the organs, to inflammation, as from injuries, to a broken copulatory organ, lack of physical exercise, lack of functional exercise, and to old age. Excessive fat is probably the most frequent cause and is to be overcome by the proper kind of starvation.

INVERSION OF THE UTERUS OR VAGINA.

Inversion of the uterus or vagina may occur after parturition. The diagnosis is easy, as it will protrude from two to six or seven inches.

The treatment consists in washing the part thoroughly with creolin and very warm water. Take a strip of muslin about two yards long and two inches wide and begin winding from the outer end and wind snugly to the body. Allow the bandage to remain on for ten or fifteen minutes. Keep the body end tight and remove the outer part and then rebind in the same manner. This is for the purpose of reducing the organ. Remove the bandage and apply both thumbs to the center of the protruding mass and return at once by a slow, steady pressure. In some cases it is not necessary to wrap, but the application of a bandage at least once is a great aid. Retain the organ by placing one or two stout stitches across the vulva.

MAMMITIS (GARGET).

Inflammation of the udder, or, as it is commonly known, garget, is most likely to happen in heavy milkers and is due to the fact that the milk is not drawn. This may happen when a part or all of the pigs die and also from obstructed teats. It occurs as a complication to a feverish condition of the system. The symptoms are the hard, enlarged mammae. Usually the milk is withdrawn with difficulty and is clotted.

Treatment.—Remove as much milk as possible and bathe with hot water for twenty minutes three times a day. Knead the parts thor-

oughly. As a local application use a drachm each of tincture of belladonna and spirits of camphor in two ounces of lard. Rub in well. The sow should receive about two tablespoonfuls of Epsom salts every other day until the condition is relieved.

For sore teats wash with creolin or carbolic acid.

RACHITIS, OR RICKETS.

This condition is due to a lack of development of the bones. The mineral matter is not deposited in the normal proportion. It is seen in growing pigs after weaning. It is rare before weaning. It most often occurs in those that receive an almost exclusively corn diet with no milk and no pasture. It is seen more often in winter than in summer because the conditions enforce the penning and feeding of the pigs at that season. It is also seen in some litters which might indicate that it was hereditary.

Symptoms.—The disease is characterized by weakness of the bones, bending of the legs, breaking down upon the feet; there may be either a dropping or arching of the back, a spraddling gait, distorted face, bulging forehead, snuffles and paralysis. Such pigs are nearly always fat at the beginning. The disease does not tend to destroy the animal quickly, as it is a slowly progressing disease. The animal if allowed to get bad becomes helpless.

Treatment.—The treatment as far as it can be of service, is to feed less fattening food and substitute milk, oats, rye, and a little oil meal. An abundance of salt, charcoal, wood ashes and air slaked lime should be available.

RHEUMATISM.

Lameness, when not due to accidents, is most often due to either rheumatism of the muscles or joints. It is an affection occurring in the winter and spring especially when the weather is cold and damp. It is of more frequent occurrence in young pigs than in those that are mature.

The cause is cold, damp premises and exposure. Occasionally we find the disease among hogs kept under good hygienic conditions, but this is the exception. Some writers have ascribed feeding as a cause, but they probably mistake rickets for this trouble.

Symptoms.—The symptoms are usually quite pronounced, as lameness in one or more legs; the lameness may move from one point to another, but does so with less suddenness than in other animals. There is considerable swelling of the joints if the hock, knee or feet are affected. They become red and very tender to pressure. There is intense pain, as evinced by the manner in which the leg is handled and the character of the squeal. The leg may be handled so carefully that it may be mistaken

for a fracture. While the hog is asleep there will be sudden contractions also indicating pain due to a relaxation of the muscles. There is fever, loss of appetite, constipation and a general lack of condition. The pig will not exercise and will not go far for food on account of the difficulty in walking.

The treatment is divided into prevention and the management of the attack. Prevention is the cheaper and better plan. It means the providing of dry, comfortable quarters and the avoidance of exposure. The strawstack is to be avoided as a shelter, as it gives opportunity for the pigs to burrow under the straw, to pile up and become very warm and then easily chill upon exposure. It is better that the hogs should have a feeding floor and this should be some distance from the bed in order to insure exercise.

Treatment.—The treatment of the attack consists in removing the affected animals from the herd in order to secure quietude and providing dry, warm quarters. A purgative should be administered, as calomel one to five grains, salts an ounce to two ounces, castor oil an ounce, or raw linseed oil three or four ounces. The subsequent treatment should be salicylate of soda from twenty to forty grains three times a day for four days to a week. The hyposulphite of soda in heaping teaspoonful doses twice a day is also good. Recovery usually takes place in from one to two weeks.

INFECTIOUS ARTHRITIS.

This trouble affects pigs within a few days after birth, is generally noticeable the third or fourth day and as a rule proves fatal inside of the first three weeks. The trouble is due to pus germs entering the navel before it is dry. The trouble has been known for a long time in colts and calves and is commonly called joint ill. When the pus enters along the navel tract it may be localized and form a pocket or abscess cavity or they may be distributed throughout the circulation and involve any part and in this event the joints seem to suffer most. When the pus is localized about the umbilicus the accumulation may amount to from a teaspoonful to six or eight tablespoonfuls. When the joints are involved the hock, knee and pasterns suffer most, those of only one or two legs may be involved or the joints on all the legs may be involved at once.

The disease may attack only one pig in a litter or it may affect all. It may attack the majority of all pigs out of several litters occurring close together on the same premises.

Symptoms.—The symptoms are tenderness of the affected joints, a large swelling of the part, which is rapidly developed, fever, loss of appetite, usually diarrhea and great weakness. In the more severe cases the course lasts only a couple of days. In the less acute types the pig is unable to get up to suckle and dies of starvation. Occasionally the

abscesses about the joints will break or the foot may drop off. In the mildest type the joints do not swell much and the cases drag along for ten days or more and a few make a recovery. In case the pus is along the umbilicus it may discharge outside and recovery take place, or into the abdominal cavity, in which event death is sure to occur. Upon post-mortem abscesses are frequently found diffused throughout the body.

Treatment.—Medication is of little or no benefit in these cases. The writer does not believe that enough can be saved to warrant an attempt at treatment. It is important to prevent the recurrence of the trouble and the bedding should be removed and burned. If the pen can admit of sunlight so much the better and do not use for farrowing again for a season. Pens that can not be thrown open to the sun should be disinfected with carbolic acid or whitewash. Do not permit the sows to farrow close to an affected litter.

HYDROPHOBIA.

Hydrophobia in the hog is always the result of the bite of some other animal and is probably of less frequent occurrence than in the horse, cow or sheep.

Symptoms.—The symptoms are first quiet and dullness, which may last from six hours to two days. During this time the hog will eat and the condition would pass unnoticed in the first cases that occur in a herd. This is succeeded by a period of nervous excitement. The pig is on the alert, and will stand and stare as if looking at some object at a distance. There is grunting and squealing, champing of the jaws, frothing at the mouth, running about in an aimless manner, crawling under buildings and burrowing under litter, and in most cases will rub some spot with great violence. This is usually the point at which he has been bitten. If it happens to be where it can be reached with the teeth it will be torn out. The hog becomes cross and will bite stock or man that comes in his way. If in a pen he will back up in a corner and continue to back with all his might, but will start with fury toward an observer. The genesic instincts are very pronounced. Spasms occur and end the suffering in from twenty-four to thirty-six hours.

ANTHRAX.

Anthrax in the pig is a very rare disease, seldom occurring except from the ingestion of the carcass of an animal that had died of the disease. Some authors even deny its existence from any other source. The disease most often mistaken for anthrax is swine plague.

Symptoms.—Anthrax nearly always occurs as a result of inoculation through the mouth or throat. We usually find great swelling at this

point, which extends along the trachea. The fever is intense, respiration is difficult and loud, there is great restlessness and death from suffocation.

Burn the carcass.

HOG CHOLERA AND SWINE PLAGUE.

When and where hog cholera had its origin no one will ever be able to positively determine. It is not an old-disease in the sense of having been known and described for a long time, like glanders or anthrax. Neither is it such a new disease as some would have us believe. The oft-repeated assertion of old farmers that twenty-five or thirty years ago the disease was unknown is merely evidence that the disease was not so generally distributed throughout the country. According to earlier investigations, an outbreak of the disease occurred in Ohio in 1833, again in South Carolina in 1837, in Georgia in 1838, and in Alabama, Florida, Illinois and Indiana in 1840. As close observations were not made or records kept upon stock diseases at that time, no doubt many outbreaks escaped unrecorded.

It is not known from whence the disease came; some writers claim that it was introduced into this country by the importation of hogs from England, while others hold that the germs are native to our soil and only need a favorable opportunity to produce the disease, the same as in anthrax.

Hog cholera seems to have been introduced into this State from Ohio by the driving of hogs to the southeastern and southern counties for the purpose of fattening. At first the disease was confined to a narrow tract along the Ohio River, but the disease gradually spread northward and westward until it reached Terre Haute in 1847 and 1848. The first agricultural report, published in 1859 and 1860, contains a most interesting article upon this disease and dwells upon the heavy losses sustained in the southern part of the State. The history of the spread of this disease—following the lines of commerce—is strong evidence that it is not one indigenous to our soil. Every county has now been invaded and some of them very frequently, so that it may be said that we now have a permanent infection.

LOSSES.

The total loss to the swine industry in the United States has been variously estimated at from \$10,000,000 to \$25,000,000, but there can be no doubt that in some years the loss greatly exceeds the latter figure. In 1896 it is probable that the loss was between \$45,000,000 and \$50,000,000. The annual losses vary between \$1,250,000 and \$5,000,000 in our own State.

According to the Bureau of Statistics the losses in the different years have been as follows:

<i>Year.</i>	<i>Number.</i>
1883	288,286
1884	351,156
1885	326,555
1886	402,164
1887	512,692
1888	326,359
1889	247,114
1890	256,991
1895	278,143
1896	580,267
1897	899,457
1898	372,868
1899	553,930

The average loss for the thirteen years has been 5,395,982, having a value of more than \$2,000,000. This loss will not be reduced to any appreciable degree in the near future. We know more about the cause of the disease, more about the disease itself, more about its relation to sanitary surroundings, but we do not know more about treatment nor much more about practical preventive measures than was known ten years ago. There is no doubt but that proper sanitary surroundings, pure food and water will do much to avert the losses, but these conditions will not be provided except by the few who appreciate the advantage of preventing loss. Moreover, these diseases can not be wholly prevented by the best hygienic measures that can be provided, which tends to discourage those who do try and makes others more negligent. Knowing about hog cholera is like knowing about the grip—it does not follow that we can control all the conditions that strew the germs of disease.

TWO DISEASES.

Hog cholera and swine plague have been made the subjects of special investigation by the United States Bureau of Animal Industry and the greater part of our knowledge of these diseases comes through this source. There is also much credit due to numerous individuals who have studied these affections. Hog cholera has been known for a long time and is recognized as being identical with the disease called swine fever in England. Swine plague was not recognized until about 1890. These two diseases are the cause of practically all of our great losses among swine. In some outbreaks it is easy to distinguish which is present and in others the two affections may exist in the same herd.

There is a specific germ for each of these diseases. Hog cholera is

caused by the germ or bacillus of hog cholera and swine plague by the germ or bacillus of swine plague. These germs differ in size, shape, activity, method of growth, resistance to external conditions, and in their effects upon the body. These differences are recognized by those working with the disease, but of course can not be seen without the special equipment found in laboratories. These differences may be briefly stated as follows:

The hog cholera bacillus is a small plant about 1-25,000 to 1-15,000 of an inch long.

The swine plague bacillus is only about one-half of this size.

The hog cholera bacillus is shaped like a short cylinder, rounded at each end, and has a number of delicate projections from the sides and ends like hairs.

The swine plague germ is oval and smooth.

The hog cholera germs have distinct movement.

The swine plague germs have no movement.

The hog cholera germs stain uniformly.

The swine plague germs will stain only at each end.

Hog cholera germs will live in the soil from two to three months.

Swine plague germs will live from four to six days.

Hog cholera germs will live in water from two to four months.

Swine plague germs live only from ten to fifteen days.

When hogs are fed upon cholera germs they will become diseased.

When hogs are fed upon swine plague germs they do not contract disease.

When hogs are inoculated with cholera germs the disease affects the intestines.

When hogs are inoculated with swine plague germs the lungs are affected.

There are other differences between these germs, but those enumerated should be sufficient to satisfy the general reader. The cause of hog cholera is always the bacillus of hog cholera and of swine plague the bacillus of swine plague, and no case of either of these diseases occurs without the germ being present. Other causes may produce diseases with similar symptoms and may thus be mistaken for these diseases. Other causes may so weaken the system as to make the animal easily susceptible to these diseases or external conditions may be favorable for the distribution of the germs. These are secondary causes, but are of great importance.

THE EFFECT OF THE GERMS UPON THE BODY.

The germs of hog cholera are found in the blood and in the internal organs. They grow in bunches and as they are carried along in the blood stream to the small arteries and capillaries they act as little plugs to shut

off the circulation in the part supplied by the little vessel. At each place the circulation is thus arrested we have a small red blotch, so frequently seen in the skin, meat, fat, and viscera of hogs that die of cholera. These blotches are so characteristic that meat inspectors have no difficulty in detecting cholera carcasses while hanging upon the gambrel. Another characteristic is that these blotches become redder the longer the time after death, while blotches from other causes become paler.

The spleen, or milt, as it is commonly called, becomes enlarged, softened and filled with dark blood.

The intestine is the seat of more or less inflammatory change, particularly in the Pyerian patches and along the lymph tracts. The caecum is especially liable to these changes. In all cases in which the disease continues for some days there is ulceration. The ulcers may be small like a millet seed or be as large as a dime. They may be irregular, as in cases in which they follow the lymph spaces. The edge of the ulcer projects above the surrounding mucous membrane. The appearance of the surface may be yellowish, reddish, or brownish. The edges are not clean-cut, but are granular. The ulcer may be only in the mucous coat or in the mucous and muscular, but it is rarely perforating. Hemorrhages sometimes occur as a result of invading an artery or vein. The lymphatic glands along the intestine are always red and swollen and those in other parts are enlarged. The contents of the intestine are nearly always black and tarry and have a very foul odor. In some cases the hog will have eaten clay or other earth, causing very hard, dry faeces. The stomach is not often seriously affected. The lungs are either not affected or only secondarily. They usually collapse at death.

The swine plague germs are more diffused through the circulation, but may cause the same red patches. The parts attacked are the lungs primarily and other organs as complications. The effect in the lungs is to cause bronchitis and pneumonia. The mucous membrane becomes congested and thickened, blocking certain areas, and sepsis or pus formation occurs, making abscess cavities of greater or less size. These pneumonic areas may be small and numerous or a few and quite large. If the hog should die early in the disease the appearance will be that of pneumonia, but if late these abscesses will have formed and they will contain pus or cheesy material. The other organs are involved secondarily.

It will therefore be seen that hog cholera affects the intestines primarily and that the disease may extend to the lungs and that swine plague begins with the respiratory organs and progresses toward the intestines. Both diseases may be present in the same subject and the lesions will be confusing. Furthermore, it is to be remembered that the lesions are not always typical and that a diagnosis can not be made by the eye alone. This is recognized by the inspectors of the meat inspection service and now all cases are reported as hog cholera, while formerly they divided them.

THE LIFE OF THE GERMS OUTSIDE OF THE BODY.

The general behavior and effects of the germs inside of the body are fairly well known, but the history of the germ outside of the body still remains to be determined. The experiments which have been made with the hog cholera germ have not shown it to be able to live for more than a few months in soil or water, and the results of the work with the swine plague germ have indicated that it can only live about half as long. The results of these experiments are at variance with the experience of any one who has had much field work to do. It is not an uncommon occurrence to have an outbreak of hog cholera follow the turning of hogs upon a field where others had sickened, died and been buried a year prior. Such a result often occurs after hogs have rooted out and eaten parts of carcasses that have been buried for a long time. The writer saw a typical outbreak of cholera follow the turning of hogs into an old house where others had sickened and died three years prior. After the first herd had died the doorways were blocked with rails and no stock had access to the place until three years later. The bedding had never been removed and in two weeks thirty out of thirty-six hogs were sick, and it was the only outbreak in that vicinity. People have related many cases similar to the above, the period sometimes being longer and at other times being shorter. Again we may note the turning of fresh hogs into a pen where dead hogs have just been removed and no disease follow. We can not explain all these apparently inconsistent cases upon the evidence from our experimental data.

The germs of some diseases, as glanders, can live for only a short time outside of the body, and hence can only be conveyed by close contact or by animals being placed in the stalls or pens where other cases of the disease have been. Such diseases can be stamped out by slaughter and rigid quarantine. Hog cholera and swine plague do not belong to that class of diseases. In other diseases of which anthrax is a type, the germs can live and multiply outside of the body for a long time and be able to produce the disease when a favorable opportunity arises. Anthrax has been known to occur as a result of eating the forage from the graves of former victims. There are observations which seem to show that the germs must have lived in the ground for at least seventeen years. The experiments with the hog cholera germs do not show them to possess the same resistive qualities attributed to anthrax, but there are many who do believe that they have a very similar life history in nature. If such be the case then the problem of how to control the malady becomes all the more difficult.

Our present knowledge of the germ tends to show that in many respects its life history is like that of the typhoid fever germ. No one would claim that the diseases are identical or that typhoid is as virulent or contagious as hog cholera, but there are points of resemblance. The

lesions in the intestines, lymphatic glands and spleen, in the two diseases, are so much alike that cholera is often called pig typhoid. When a drop of blood from a typhoid patient is placed in a culture of typhoid germs it causes them to cling together. When blood from a cholera hog is placed in a culture of cholera germs it causes a similar reaction. Typhoid germs are never found outside of the body and stools of a sick patient, but it is well established that all epidemics have their origin in the water supply. Epidemics of typhoid fever occur in cities, and no matter what may be the source of the water supply—river, lake or wells—it will be found that it is polluted with the discharges from people. Typhoid fever can always be arrested by securing pure water. The researches of the Indiana Experiment Station have demonstrated that the disease is also water borne. In a series of townships in this State it was found that from 33 to 200 per cent. more hogs were lost along the rivers and streams than at a distance from three to ten miles away from the stream. This could be attributed to the more general use of surface water. No such conclusion must be reached that the disease is only water borne, for we have seen the disease pass up the river as well as down and the pigs in a whole section of the country, from one to three miles wide, and from five to seven miles long, become affected simultaneously after a rain.

Less is known concerning the life history of the germs of swine plague than of those of hog cholera. It is known that the disease is more difficult to prevent than cholera; its spread is less liable to be influenced by hygienic measures and it seems to be air borne. Germs very much like the swine plague bacillus have been found in the lungs of other animals. If upon further investigation they should be found to be the same, it will add to our knowledge of the nature of the affection and make us less ready to claim that the disease can be eradicated by sanitary measures.

THE WAYS BY WHICH THE GERMS ENTER THE BODY.

Experiments have been conducted to determine how the germs find their way into the body to cause disease. Hogs fed upon the carcasses of animals affected with cholera develop a virulent form of the disease in a short time. The intestines become the seat of typical lesions, while other parts are not seriously affected. If the germs be placed upon food or in drinking water they will produce a like result. These experiments show that if the germs be ingested with the food or water they will develop and produce the disease.

The germs have been sprayed in the air and the hogs made to inhale them, also injected into the windpipe, but the disease did not develop, which may be taken to indicate that in nature the disease germs do not find a point for development in the lungs, or at any rate not as a primary focus.

The germs have been inoculated beneath the skin, but it is only when

very large numbers are used that disease occurs. This would seem to indicate that the hog does not contract the disease from inoculation as by the bite of the louse and injuries.

A similar line of experiments conducted with swine plague shows that it does not cause trouble when swallowed, but does do so easily when made to inhale air containing the germs or when germs are injected into the windpipe. The lungs are the primary seat of the affection, and thus differs from hog cholera. Inoculation experiments, both subcutaneous and intravenous, require such large numbers of germs that it would seem that natural inoculation by the louse bite could hardly prove fatal.

The conclusions from these experiments are that in nature, cholera is caused by the ingestion of the germs with the food or water, and swine plague by inhalation.

ACCESSORY CAUSES.

We consider all those factors which lower the resistance of the animal or which disseminate or propagate the germs as being accessory causes.

Among the causes which tend to lower resistance we may consider feeding, shelter and breeding. The disease is often attributed to the feeding of green corn, too much corn, etc. In 1896, the Iowa Weather Bureau published a map showing the distribution of the disease in the State. It was found that the greatest losses were sustained in those countries where corn constituted an almost exclusive diet. The lowest death rate was sustained in those countries in which dairying was an important industry and milk was largely used as a feed. This was taken as confirmatory evidence of the bad influence of a corn diet. In 1897, the statistics showed that the losses were just the reverse from those in 1896; that the pigs fed upon corn suffered least. This disproved the conclusion of the previous year. As farmers feed in essentially the same way each year, it would be but rational to expect that the losses would be about the same if the feed was a causative factor. Neither is the sudden changing of feed a causative factor, as we have not yet had a single report of an outbreak of cholera at any experiment station as a result of a sudden and radical change of feed. The feeding of green corn or all corn can not be considered a wise health measure. When green corn is fed it should be with the same precautions as in the feeding of cattle—beginning gradually with old corn and increasing the quantity as the pig is able to stand it. This will avoid the diarrhea and intestinal irritation which prepares the way for the cholera germ. Any injudicious management in any kind of feeding will have the same effect. The hog needs a variety of food for strength and health and those best prepared to furnish it will probably fare best.

The hog needs some shelter; it need not be elaborate, something to break the scorching sun or beating storm, to have dry quarters in which

to sleep and a clean floor from which to eat. The strawstack is the poorest shelter that can be provided, as it furnishes a place in which to pile up and be buried, overheated when lying down and makes a fit victim to cold. The hog does not need much bedding. A tight wooden floor upon which to feed is rapidly growing in favor from economical considerations, and will become equally as popular from the health standpoint when its value becomes better understood.

The breed of the hog makes no difference to the cholera germ. The objection often made by the farmer that pure-bred hogs are less resistive to disease is not well founded in fact. The razor-back, with digestive powers equal to any task that may be imposed upon them will succumb to the diseases the same as the finely bred Berkshire or Poland-China. No breed of hogs is immune to the disease, and the advice to cross our better bred swine with the southern hog is ill founded. All the advantage which they possess is in the fact that they are not so fat and all the vigor that will prevail against the disease can be obtained by using care in the handling of the improved breeds.

Among the agencies which may carry the germs are streams, wind, birds, dogs, people passing from one farm to another, buying hogs from infected herds, shipping hogs in unclean cars, exhibiting at fairs, etc. Some of these means are not within our control, but many of them are and a proper understanding of them should lead us to prevent thousands of cases.

Undoubtedly the most important agency in the distribution of the disease are the streams and surface water supplies. I have emphasized this point often but it will bear repetition. It has been known for some time that there was a relationship between the water supply and the disease, but it is only since the investigations by this station were undertaken that the real facts have been ascertained. In 1895 the 60 townships bordering upon the Wabash, from Cass County to its mouth, show a loss of 150 head out of every 1,000 produced; 47 townships in the second tier removed from the river show a loss of 100 head per 1,000, or 50 per cent. more loss in the first tier than in the second tier. In 1896 the bordering townships lost 294 hogs per 1,000, the second tier 205 and the third tier 160. In other words, the loss was 43.4 per cent. more in the first tier than in the second tier, and 83.8 per cent. more than in the third tier.

In 1895, 44 townships bordering upon the north fork of the White River lost 138 hogs per 1,000, and 42 townships in the second tier 65 hogs per 1,000, or 112 per cent. greater loss in the townships bordering upon the river than in those a few miles removed. In 1896, the loss in the first tier was 231 per 1,000, in the second tier 156, and in the third tier 75, or 48 per cent. greater loss in the first than in the second, and 208 per cent. greater than in the third. In 1896, 44 townships bordering upon the south fork of the White River lost 200 hogs per 1,000; 58 townships in the second tier lost 150, and 42 townships in the third tier lost 109; thus mak-

ing 33 per cent. more loss in the first than in the second, and 83 per cent. more loss than in the third. In 1897, the first tier of townships bordering upon the river lost 321 hogs per 1,000, the second tier 182, and the third tier 145; 76 per cent. greater loss in the first than in the second, and 121 per cent. more than in the third.

In every general epidemic of the disease of which I have record in this State the disease has spread from the rivers to the higher land. The evidence furnished by the large number of townships and for successive years should leave no doubt as to the important role which streams and surface water play in the spreading of this disease. If the larger streams are such important factors we can reason that the smaller streams have a like effect. Drs. Salmon and Smith made the following statement in their investigations of the disease. It is pertinent and should be remembered by all swine breeders: "Perhaps the most potent agents in the distribution of hog cholera are streams. They may become infected with the specific germ when sick animals are permitted to go into them, or when dead animals or any part of them are thrown into the water. They may even multiply when the water is contaminated with fecal discharges or other organic matter. Experiments in the laboratory have demonstrated that the hog cholera bacilli may remain alive in water four months. Making all due allowance for external influences and competition with the bacteria in natural water, we are forced to assume that they may live at least a month in streams. This would be long enough to infect every herd along its course."

It is a common practice throughout this State to give the hogs surface water in which to wallow and to drink. Small streams are dammed, drinking places are built into the rivers, a basin is scooped out to receive the water from a barnyard, open ditch, tile drain or spring. All of these afford the best conditions for introducing the germs into the herd. It is not uncommon to go along a public ditch or a stream during an epidemic and find the carcasses of hogs in every stage of decomposition, thus acting as the bearer of infection to new herds. The conditions are better now than ever before, but there are unscrupulous men who will take that means of disposing of their dead, and some one else must suffer.

Some springs afford pure water but many have only a surface origin and are no better than a tile drain. The worst feature connected with the use of a spring as a water supply is the fact that no provision is made for keeping the water clean and pure. The water usually collects in a pool and receives the surface drainage from all the land around and serves as a wallow. Under such circumstances it becomes little better than a pond.

In 1895, the station made an inquiry as to the source of the water supply used by the breeders of pure-bred swine. It was found that in nearly all instances in which they escaped disease they used well water. Hogs receiving well water do become affected, but when we consider the numerous ways by which the infection can be carried we are not at

all surprised. A good well, however, must always be considered as furnishing the maximum protection.

A study was also made of the relation of rainfall to the disease. No relationship could be traced to the total rainfall for the year or to the total rainfall for any set of months. In general, a season with sufficient rainfall to keep a constant supply of fresh water in the streams or one of sufficient drought so that the small streams, ponds, etc., become completely dry, are productive of least cholera. A year in which there is much stagnant water is productive of the greatest death rate.

The argument is advanced that the greater loss occurs along the rivers because more corn is raised, more hogs are fattened, and hence they are more crowded. In order to determine this point we divided the counties in the State into groups according to the number of hogs raised per square mile and determined the per cent. of loss for these groups. This is presented in the following tables:

1883-1890.

<i>Number of Hogs Per Square Mile.</i>	<i>Number of Counties.</i>	<i>Per cent. of Loss.</i>
1- 24	1.....	8.1
25- 49	7.....	4.5
50- 74	20.....	5.9
75- 99	12.....	9.1
100-124	16.....	8.3
125-149	11.....	7.9
150-174	7.....	8.1
175-199	10.....	8.8
200-224	8.....	10.

1895-1897.

1- 24	2.....	7.7
25- 49	22.....	9.1
50- 74	18.....	11.1
75- 99	16.....	17.9
100-124	12.....	19.2
125-149	8.....	17.3
150-174	7.....	21.6
175-199	4.....	22.2
200-224	3.....	26.

During a period of eight years there is comparatively little difference in the losses, but during the period of three years when the disease raged with unusual violence the percentage was much higher in the counties having a large number of hogs per square mile. It is not possible to tell

how much of this increase in loss is due to the greater number of hogs, as it so happens that the counties having a very large number of hogs per square mile and large percentage of loss also have one or more rivers passing through them. From a comparison of counties about equally situated but the number of hogs per square mile very different, I am of the opinion that the number raised is not a very important factor in determining the per cent. of loss.

The season of the year when cholera is most prevalent is always in the late summer and fall. It occurs at all times of the year, but like all the intestinal diseases, as dysentery, typhoid fever, etc., in people, the conditions are more favorable for germ development in the fall.

The germs of the disease may be carried from one place to another by birds of carrion. It is a common experience with farmers that hogs can not be raised upon a farm where there is a buzzard roost. I have learned of isolated outbreaks of the disease occurring from buzzards alighting to eat the carcass of a colt or other animal and soon after the hogs gain access to the same place and contract the disease.

Dogs prowling about at night carry pieces of dead animals for a mile or more, across pasture fields, feed lots, leaving pieces here and there to be devoured by some unfortunate animal.

Men may carry the disease from place to place upon their boots, or particles of dirt remain upon the wagon wheel and when dry drop off in another lot. It should be a general rule never to allow agents for hog cholera cures to come near a pig lot where there are healthy hogs. They go about diseased hogs and do not use the precautions necessary to prevent the spread of infection.

Under some circumstances I believe the wind may be the bearer of germs. If the germs be distributed along a public highway by the rendering wagon and become mixed with the dust it is possible and altogether probable that they may be blown on the pasture or on the feed lot and thus convey disease. I have seen a few outbreaks continue in one direction for several days after a constant prevailing wind from the southwest. The evidence in this case seemed to point to the wind as the distributing agent. In such cases the germs fall in the water or are taken in with the food.

Hog cholera is often contracted as a result of buying hogs from stockyards for feeding purposes. This is such a common experience that only the strong-headed or uninitiated will be likely to take the risk. The large stockyards and the majority of shipping cars are permanently infected with disease and no matter how healthy the hogs may have been when they started from home they come in contact with infection and should never be withdrawn from the yards for feeding purposes. We have recorded many outbreaks caused in this way. It has been claimed that the shipping of diseased hogs over the railroad may be the means of causing new outbreaks of disease. I made this a particular object of

research in 1895 and 1896, but in no case have I been able to find more cholera along railroad lines than at a distance of a mile or two upon either side. Under the present method of having the right of way fenced I feel certain that the infection from this source is over-rated.

It would be useless to try to go into detail concerning all the methods by which the disease is distributed. Any means by which the germs are carried from one place to another can be considered an accessory cause. All of these means are not under our control but many are and we will succeed in prevention in the same measure as we eliminate them.

SYMPTOMS.

The diagnosis of the different swine diseases is attended with greater difficulties than the diagnosing of diseases in horses or cattle. Except upon very careful examination the general symptoms of swine diseases seem to be very much the same. Cholera assumes several different forms and therefore can not be recognized by any specific set of symptoms.

The symptoms vary greatly with the virulence of the outbreak. It may be said to assume an acute form which may run a course in from a few hours to two or three days, a subacute form which runs its course in from three days to a week, and a chronic form which may last from one week to more than a month. These are only relative terms and merely used for convenience in describing the disease. The symptoms as here described are for the more common cases that live for three to seven days. About the first symptom to be observed is a general droopy condition, the eyes more or less closed and dimmed, the ears drop more than usual, that there is a certain amount of sluggishness and although the hog eats, it is not with that greediness that is customary. The appetite becomes depraved and he will eat the droppings from other hogs or chickens, eat clay and earthy substances. The hog lies about more than usual, hiding in fence corners, under litter, and in out of the way places. If he should have access to a manure pile, that will be a favorite place. During the hottest days he will prefer to lie in the scorching sun rather than in the shade. At first he will respond to calling for feed but later he will not get up unless urged to do so. During the progress of the disease and sometimes from the very beginning there will be pronounced rheumatic symptoms. The hog will be lame first in one leg and then in another. The back will be arched. Diarrhea usually makes its appearance with the onset and is almost always present at some time during the course. The discharges at first are thinner than normal, but they rapidly become tarry and have a characteristic offensive odor. Constipation may occur and is almost sure to do so in those animals that eat earth. In some of the animals the contents make casts that perfectly occlude the passage and when struck with a board give the sensation of baked clay. Vomiting is also present. There is rapid emaciation. The fever is high and the breathing rapid but not labored.

In the very acute cases the toxins cause such rapid poisoning of the system that death is so sudden that the symptoms may not be developed. A pig that will be eating at the trough at one hour may be dead the next.

In the chronic type we are especially prone to have the swelling of the ears and cracking of the tail. Both may drop off. The eruption is more pronounced upon the skin. Ulcers may form from the size of a grain of wheat to the size of the hand. The hair is lost. There is frequently hemorrhage from the nose and sometimes sore mouth and feet. There is coughing as a result of lung involvement.

In hog cholera the great fatality is among the pigs, the older hogs often making a recovery or not being attacked.

In swine plague a cough is probably the first symptom observed. It is paroxysmal at first but is deep seated. This is more noticeable when the animal first gets up or after exercise. Later the cough is more persistent. The breathing is short and rapid with little movement to the ribs and a double hitch in the flanks, like a horse with heaves. The breathing becomes more labored, the throat swells and there is nose bleed. If the hands are pressed over the ribs there will be evidence of pain, often due to pleurisy. The animal will not move more than necessary, the appetite remains better than in cholera, there is much thirst and much less tendency to diarrhea. Constipation is more frequently present than in cholera. The eyes are more inflamed and watery and there is less tendency to skin eruption. Swine plague is particularly liable to attack and be fatal to old hogs. Both diseases may be present in the same herd and even in the same animal at one time, thus complicating the symptoms. In nearly all cases where there is doubt and a number of hogs are similarly affected in the same neighborhood it is safe to conclude that one or both of these diseases are present. We have no other wide-spread diseases of hogs causing such loss.

Hog cholera is sometimes mistaken for other diseases, as worms, diarrhea, or scours, septicemia or blood poisoning, etc. Swine plague is frequently mistaken for pneumonia, pleurisy and bronchitis.

In some places the intestinal worms become so numerous as to cause all the intestinal symptoms ascribed to cholera, vomiting, diarrhea, depraved appetite and emaciation. The onset of the trouble is not so sudden; there is not the same temperature, usually no lameness, and no skin eruption. The worms causing the trouble may be the large intestinal worms, the size of a lead pencil or larger, or the small fellows from one-half to three inches in length. A post-mortem will show the presence of the parasites in great numbers and the intestines will be more or less irritated. The presence of the parasites causes so much loss that some of the cholera cures are nothing but vermifuge powders. The lung worm may also produce symptoms that will be mistaken for swine plague.

Diarrhea, or scours, may also be mistaken for cholera as it is so often induced by a change of feed as turning upon new corn, feeding city slops

that contains soap and sour feed. The discharges are usually more fluid and of lighter color than in cholera. The diseases can not be distinguished in the early stages, but a change to a limited dry diet will usually be all that is necessary to bring about the desired result in the diarrheal trouble.

A form of septicemia, or blood poisoning, sometimes attacks a bunch of pigs and being contagious, spreads from one to another. The mouth, nose, lips, tongue, feet or other parts of the body become gangrenous. While the disease presents some of the symptoms of cholera, the localization of the trouble is sufficient to make a diagnosis.

Hogs will pile up in bunches when not properly divided and protected during the cold weather, and as a result catch more or less severe colds, resulting in bronchitis, pneumonia and pleurisy, giving rise to symptoms like those of swine plague. The same troubles may also appear as a result of turning hogs upon a stubble or pasture field during very hot weather and then permitting them to have access to cold springs or brooks in which to wallow. These same troubles sometimes arise from the inhalation of dust. A study of the conditions will usually suffice to differentiate the troubles.

NUMBER OF ANIMALS AFFECTED, AND IMMUNITY.

When an outbreak of cholera occurs in a neighborhood we can not judge what per cent. of the hogs will be affected and die. Some outbreaks have a virulent type of the disease on the outset and gradually the virulence diminishes so that while from eighty to one hundred per cent. of the hogs affected at the outset may have died only ten per cent. may be affected and die out of herds attacked later. As a rule the disease is more virulent in type when it makes its first appearance. The reverse of this is true in some instances. Out of a large herd of mixed hogs it is always safe to predict that the younger ones will die and that from ten to thirty per cent. of the older ones will escape. Here is where hundreds of farmers are duped into believing that certain hog cholera cures accomplished great good, as they lose the susceptible ones before a remedy is tried and then succeed in saving those that would have lived anyhow.

One attack usually confers immunity against subsequent attacks, but there are exceptions. An animal then that passes through the disease becomes valuable as a breeder. After sows lose the litter of pigs which they may be carrying at the time, but it has no influence upon subsequent litters. No immunity is conferred upon the offspring, as they are as susceptible as any to the disease.

TREATMENT.

The treatment naturally divides itself into medicinal, hygienic and preventive. The medicinal is the least important as we have no spe-

cific for the disease. Veterinarians who have made a careful study of the action of drugs and of the character of the disease have tried everything that would seem to be a rational treatment, but have failed. Pathologists have recognized the apparently hopeless condition to be treated and have been unable to suggest a remedy. Experimenters have tried everything which science and empiricism has claimed would cure but they have found nothing which they could endorse. Notwithstanding all the futile efforts that have been made by careful and conscientious workers, backed by large sums of money and every facility for investigation, we have more than one hundred sure-cure cholera remedies upon the market in this State. According to the manufacturer (and the claims are all alike), the prevention and cure of hog cholera is a very simple thing and depends wholly upon whether the farmer is willing to buy a few packages of their remedy and use as directed. It is impossible to make a close estimate of the amount paid for such preparations, but it is safe to say that in this State it amounts to more than \$100,000 annually.

In 1897 and 1898 the writer devoted considerable time to the investigation of the merits of the various preparations upon the market. Many of these preparations are the product of misguided men, wholly ignorant of the pathology of the disease and equally as ignorant of the action of the ingredients in their concoctions. From a very limited trial they had drawn conclusions and sincerely believed they had discovered a sure cure and were willing to part with it for a large compensation.

A much larger number of the remedies are prepared by men and companies who know the value of a well-worded advertisement and who are in the business for revenue only. They take the government formula, alter it in some slight particulars, call it by another name and increase the price probably ten times. Another favorite scheme is to take the formulae of some of the patented preparations and sell the remedy under a new name, well knowing that if it failed under one name that it would act no better under a new. I was informed that Brown County clay sold for seventy cents per pound.

A third class of remedies are prepared by men who make a study of the disease. They constitute a very small minority.

There is no better evidence that we have no sure remedy than the fact that we have so many upon the market. In these experiments one hundred and fifty-six remedies were tried and nearly 4,200 pounds of drugs. All the formulae given in the patent office reports were filled. A large number of formulae were obtained from the owners and manufacturers, a few by analysis and several hundred pounds of the proprietary remedies were used.

The plan was to test each remedy upon at least five herds in as many places and at different times during the season, in order to work over all the conditions. Without going into details, it may be said that none of them fulfilled their claims. Some were positively injurious. Many

of them seemingly did good upon some herds and if a hurried conclusion had been reached it would have been favorable. This is an error too often made and no test can be considered satisfactory that is not used upon a large number of hogs in different herds, in different localities and at different times during the season. The good effects often reported are frequently due to the better care and better hygienic conditions in following the directions. Some manufacturers accompany their goods with carefully compiled directions upon care and management, and as they cost considerable it insures their being carried out. It must be confessed, however, that directions come high at fifty cents per pound.

Very few remedies find a place upon the market for more than five years. The great majority of them run their course in two years, and the writer is cognizant of but three that have been sold for a period of more than ten years. This is the test of their efficiency. In every instance in which an attempt has been made to take infected hogs from the stockyards, treat them and fatten them for the market the result has been a failure.

In 1897 Mr. John Cowie, of Iowa, tested a number of the more widely advertised remedies and the results were unfavorable. Dr. Reynolds, State Veterinarian for Minnesota, after examining the matter carefully, issued a circular advising the farmers not to purchase the remedies.

In mild outbreaks and in very many cases much good can be accomplished by such remedies as will keep the bowels clear and act as an alterative and tonic. For this purpose we have a prescription generally known as the government formula, and is as follows:

Wood charcoal, 1 pound.
Sulphur, 2 pounds.
Sodium chloride (salt), 2 pounds.
Sodium bicarbonate (baking soda), 2 pounds.
Sodium hyposulphite, 2 pounds.
Sodium sulphate (Glauber salts), 1 pound.
Antimony sulphide, 1 pound.

The dose is a tablespoonful for each 200 pounds once or twice a day. It is best given in slop. This costs about ten cents per pound and is the one so much imitated and sold under different names at from twenty to fifty cents per pound.

Our best results in the treatment of mild cases were obtained by using the following:

Chlorate of potash, 1 pound.
Bicarbonate of soda, 1 pound.
Nitrate of potash, 2 pounds.

The dose is the same as in the former prescription. In the early stages and when constipation is present five grains of calomel are admin-

tered once a day to each 200 pounds of weight, or oil meal is added to the slop.

Another treatment which found considerable favor was a tablespoonful of a saturated solution of chlorate of potash and a like quantity of tincture of muriate of iron once or twice a day for each 300 pounds.

A half gallon of kerosene to a barrel of slop mixed thoroughly gave better results than three-fourths of the remedies tried.

Quinine and salol were also of service.

Carbolic acid and like preparations are disinfectants and not cures.

The treatment of inoculating worn-out horses with cholera germs, killing the horse and feeding it to the hogs was not a success. The feeding of the carcasses of hogs that had died of the disease and been buried is to be condemned. The boiling of the carcasses of cholera hogs and feeding them has likewise disappointed those who have tried it. A final method of prying open the hog's mouth and cutting off the papillae inside of the jaw only abstracts blood.

PREVENTION BY VACCINATION.

The attempt to prevent hog cholera by vaccination is dependent upon the fact that one attack confers immunity against subsequent attacks. Vaccination has been used against smallpox in the human subject with the most marked success. In this case the pox germ is obtained from the cow and when vaccination takes place it induces a very mild disease. Vaccination is also used against anthrax in sheep and cattle. Here the disease germs have had their vitality reduced by artificial means and only a mild attack follows. The results are highly satisfactory and sheep and cattle are now raised where it was impossible to do so before.

The attempts to vaccinate against cholera have not been successful. In the first place, we know of no animal having a similar disease, the germs of which when inoculated into the hog will confer immunity, and no method of attenuating the germs so that they can be inoculated with safety has yet been discovered. Some years ago Billings and Detmers each thought they had discovered successful means of vaccination and the work was carried on on a large scale. The results were unsatisfactory and had to be given up, as it had the effect at times of starting the disease where it did not previously exist. The work is being revived at the Kansas Experiment Station and again being reported favorably. The matter needs to be more fully demonstrated before advising the stockman to try it.

THE ANTI-HOG CHOLERA SERUM.

The serum treatment of hog cholera was probably first demonstrated by Dr. Peters in 1896, and the same work undertaken at almost the same time by the Bureau of Animal Industry. The serum treatment is based upon the same principles as are involved in the anti-toxin for diphtheria.

It is a well established fact that in some bacterial diseases a strong resistance to the growth of bacteria is developed by the formation in the blood of a substance known as anti-toxin. The germs form a toxin or poison and the body forms the anti-toxin to counteract the growth of the germs. If the formation of the anti-toxin is in excess the patient recovers, and it has been found that blood from such a patient can be drawn, the anti-toxin separated, and if added to the blood of a patient that is exposed or affected it will prevent the disease or bring about a recovery. In order to secure anti-toxin in medicinal quantities it is usual to inoculate animals that do not have the particular disease and produce a slight attack and after recovery reinoculate and repeat until the animal can stand an enormous quantity at one time. A quantity of blood is drawn and the serum separated and this is ready for use.

The government has experimented upon a large scale with this treatment and in the main the reports have been very favorable. A number of private firms have attempted the same thing, but up to the present they have not been very successful. This treatment does not promise nearly so much, in the estimation of the writer, as the public has been led to suppose. The serum can not be produced at low cost and its administration requires the services of a veterinarian, two conditions which militate against its general usage.

IMMUNIZATION IN UTERO

Just at the present time a new preventive is being pushed upon the public under the above caption. The proof of the efficacy of the method has not yet been demonstrated. Reasoning from analogy with other diseases in the human or in animals, we have very little reason to believe that such can be accomplished. The method is to induce the disease in the sow by feeding from the carcass of a cholera subject. The disease is supposed to develop in a mild form in the mother and the immunity to be extended to the unborn pigs. The writer has seen pigs, from sows that suffered from the cholera prior to farrowing, die of the disease. It is the general experience that pigs from an immune sow do not possess immunity. This method needs to be tested scientifically before we can endorse it and this will require some time.

PREVENTION.

As we have no specific for the disease nor any line of medication that is fairly successful, we must rely upon prevention. This can not be done to the same extent as in many other diseases, and this is especially true of swine plague. To enumerate all of the steps would necessitate repetition of points already made, so that only the more prominent will be considered.

First, the water supply should be from deep tubular wells. Water

from a tubular well must come in from the bottom, which means that it has been filtered through the soil and the possibilities of pathogenic organisms being present is reduced to the minimum. Treat all surface water, whether pond, creek, spring or river, as unfit for man or beast. The feed should be pure and wholesome. Slops that have stood and fermented are not better suited to the stomach of the hog than that of some other animal. The dishwater contains so little nutrition that it would be more economical to throw it away than to feed it. Corn is undoubtedly our cheapest fattening food, but should not be given alone to sows and pigs. The addition of a little oil meal or other by-product will be most advantageous, and pasture in season. Hogs are fond of charcoal, ashes and salt, and these seem to furnish something to the body that is decidedly beneficial. The cobs from the feed floor should be raked into a shallow pit and burned to a char and salt added at least once a week. Nearly all prominent breeders follow the practice of supplying charcoal, salt and ashes in some form and many attribute to it the power of preventing disease. A feeding floor should be provided. The bedding for hogs should be like that for other stock—a little at a time and removed often. There is no better reason for compelling a fine sow to lie in her own filth than there would be in the case of a good horse. The bedding of both will become foul and should be removed. It can not be kept pure by disinfectants. Hogs should have no bedding during the warm season, only a dry place in which to sleep.

In case of an outbreak of disease upon the premises, separate the well hogs from the sick and confine all in small lots upon one part of the farm. Separate the well hogs from the sick, as the contagion is spread by the droppings and excreta and the well hogs would be subject to the contagion if kept upon the ground where the sick had been. Formerly the recommendation was made to give the hogs the benefit of a large pasture and keep constantly dividing the herd. Experience has shown that this has the disadvantage of getting the germs scattered all over the farm, prolonging the outbreak, and has no advantage over placing them in two or three small lots. By the latter method the business of hog-raising can again be started as soon as the outbreak is over, using some other part of the farm. Use plenty of disinfectants about the place. Air slaked lime, whitewash, chloride of lime, carbolic acid, etc., are all good. If possible have one man to feed the diseased and another to feed the well hogs. Take advantage of all the sunlight that it is possible to get, as that is the cheapest disinfectant.

No rule can be laid down for guidance as to the time when pens, etc., may be used after an outbreak of disease. We have observed instances in which this was done immediately and disease did not follow, and in other cases weeks and months have elapsed and a fresh outbreak would be started. If the place is thoroughly cleaned and disinfected and is well lighted a few weeks will be sufficient, but when it is feasible it is better

not to attempt it again during the same season. Experience has shown that a wise precaution is not to permit the hogs to graze or be in pens alongside a public highway. Hogs having the disease and driven to market will leave droppings that become mixed with dust and blown upon the premises. It is the observation of the writer that this is a precaution not sufficiently emphasized.

Hogs may be disposed of in two ways, by burial and burning. If by burial it should be well done, upon a dry place at least three feet deep and in a woods or field to which hogs will not have access for a long time. If it be true that the disease germs live for a long time in the soil then burial only favors the development of some subsequent and unexplained outbreak. Where burial is practical the addition of a quantity of quicklime will be effectual in destroying the germs.

Burning is not difficult when properly done. The essential point is to get at least a foot of wood under the carcass. A very much smaller amount of wood will be required where the fire is under rather than at the side. All carcasses should be disposed of at once and it is far more economical to kill badly infected hogs than to have them linger around for a week or two.

If a herd be in marketable condition when exposed to cholera they should be disposed of at once. Those that are affected will be condemned and those fit for food will pass inspection. Such a recommendation may be open to criticism from a strictly scientific standpoint, but it is the only practical method that can be followed at present. Under no circumstances should hogs be purchased for fattening purposes that have passed through stockyards or been shipped by rail. Stockyards and cars should be regarded as permanently infected places. Breeding stock should always be kept in quarantine for three weeks before admitting to the herd, particularly so if they have followed the fair circuit. These are measures that may be followed in practice by the individual.

STATE CONTROL.

The argument is often made that the State should exercise some control over hog cholera and swine plague. The precedent is cited that the government stamped out pleuro-pneumonia in cattle and has saved millions of dollars to the cattle interests. The different States take cognizance of glanders and practically have that malady under control. Southern cattle fever is now confined to restricted areas and sheep are being dipped for scab. The diseases which have been stamped out or brought under control have been of such character as to require close contact to spread them. Hog cholera is a disease of different character and therefore is not amenable to the same methods. Typhoid fever in people sometimes assumes an epidemic character in cities, but by condemning wells and compelling the use of wholesome water the disease can be stamped

out. Hog cholera is a water-borne disease and can be prevented in part by securing pure water, but there are other means of spreading the infection. We have little to guide us in what may be accomplished by State control. England has tried to stamp out the disease by preventing the shipment of pigs unless inspected, no hogs to be shipped from a swine fever district, and none to be moved within sixty days from the time of an outbreak. In the shipment of pigs all cars must be disinfected and it becomes the duty of the owner to report every case of the disease as soon as it appears and the animal is slaughtered.

Prior to 1896, the regulations were not so rigid and the effect of the attempt at control may be seen from the following table:

<i>Year.</i>	<i>Outbreaks.</i>	<i>Hogs Slaughtered.</i>
1894	5,682	56,296
1895	6,305	69,931
1896	5,166	79,286
1897	2,155	40,764
1898	2,514	43,756
1899	2,243	30,386

The effect has been to greatly reduce the number of outbreaks and also the number of animals slaughtered. For a time the reduction in the number of outbreaks and also of pigs slaughtered was so marked that much hope was entertained that it might be possible to completely control the disease. The very serious restriction to trade and the heavy expense has brought many protests from the producers and the restrictions are again becoming less rigid. It will take more time before a conclusion may be drawn as to the possibilities of this method.

In 1897 the government undertook an experiment in Page County, Iowa, to determine what might be accomplished by county police measures. The plan was to canvass a part of the county and determine the number of pigs raised the year before, the number that died and the number now on hand. Upon receipt of notice of an outbreak the veterinarian called and killed all the sick and paid the owner at market rates. Disinfection and general cleaning of the premises followed. It is believed by some that the saving more than paid the expenses.

Several of the States have laws upon hog cholera, but they usually define the manner in which the carcass shall be disposed of. Minnesota probably undertakes more than any other State and there the matter is in the hands of the State Board of Health. Canada demands a certificate of a clean bill of health from the State Veterinarian before they can be shipped in. The tendency is toward making transportation companies disinfect cars, yards, etc.

In our own State the law requires burning or burial of the carcass; it requires a certificate of health to exhibit at the fairs and the disinfec-

tion of pens, etc., at fairs. It is an imperfect law but has been the means of saving many thousands of dollars.

The Bureau of Animal Industry requires the disinfection of cars at stockyards which have brought in cholera hogs. From the observations of six years the writer can not agree with those who advocate the disinfection of all cars. There arrive at the stockyards 20,000 cars annually. The cost of disinfecting would be about \$12,000. The writer believes that for all practical purposes the same results would come from preventing any hogs being withdrawn from the stockyards for feeding purposes. The outbreaks of cholera traceable to transportation in ninety-nine cases out of every 100 are due to the shipment of hogs. The railway companies receive little freight for the stock hogs that go out of the yards compared with the loss of freight upon the hogs that die of disease as a result of such shipment. The loss then would be upon the proper party—the one who sent the diseased hogs.

The problem of State control is of great importance and will not be settled soon. In the meantime this State should not be content to sacrifice \$2,000,000 worth of stock annually without making some effort to determine new facts concerning this disease.

SURGERY UPON THE PIG.

CASTRATION.

The objects of castration are to prevent reproduction, to increase the fattening propensity, to better the quality of meat and to secure docility. Nearly every farmer considers himself competent to castrate pigs and, although the general losses are not very heavy, that could easily be reduced one-half or three-fourths by the exercise of a little more care and attention.

Pigs may be castrated at any time, but it is wise to avoid the extremes of heat and cold. In very cold weather the parts may become frosted and a great slough follow. In very hot weather sepsis is almost sure to follow and there is some danger from flies and maggots. In nearly all cases the owner can exercise some judgment and either castrate a little earlier or a little later than he might otherwise desire, and thus avoid these extremes in season.

The age at which castration can be performed to the best advantage is not fully agreed upon by different breeders. Some prefer to castrate while the pigs are still nursing, but the majority prefer to wait until after they are weaned. The younger the pig the less the shock and possibly the less the check in growth. The older the easier the operation. It is better however that the operation be not done at the time of weaning.

The pigs should be prepared for the operation by receiving a light supper in the evening and no breakfast in the morning prior to the

operation. This will prevent vomiting and the inhalation of vomited matter, causing pneumonia. After castration they should be turned upon grass and receive slops for a few days to keep the bowels open and prevent a feverish condition. Under no circumstances, however, should the pig be allowed access to a wallow. If the wound can be kept clean, it will heal in from four to six days, but if it becomes infected with mud it will take much longer.

There are different methods of operating, but the essential points of the technique are about as follows: The pig is caught and laid on the side with the head a little lower than the hips. It should be held by one or two men and the back should be turned away from the operator. The scrotum should be mopped over with a strong carbolic acid or creolin solution for cleanliness. The lower testicle is seized between the thumb and middle finger of the left hand and an incision made over the most prominent part parallel with the middle line of the scrotum and a half inch to the side of it. The incision should be deep enough to liberate the testicle at one pass and should be sure to go to the most dependent part. The upper testicle is then liberated in the same manner. In young pigs the testicle may be seized and by a quick jerk the cord and all may be drawn away. In the older pigs this is not feasible. No hemorrhage follows the tearing of the cord, but it not infrequently happens that a rupture is made which may appear at the time or a little later. A better plan is to draw the testicle well down and cut the cord. This operation is applicable at all ages. Hemorrhage will follow in a few instances, but this may be checked by a ligature. By far the best method of taking off the testicle is by the use of the emasculator, as this effectually checks all bleeding and avoids any possibility of danger. It is the method above all others for old animals. It will not pay a man if he has only a few hogs to castrate to invest in an instrument, but it will soon pay for itself if there are several each year.

No application should be made to the wound and no stitches taken, as it will heal more readily without interference. In warm weather carbolic acid or creolin may be used to prevent flies attacking it.

The castration of the ruptured pig is accomplished in much the same way as the ordinary. The pig is held in the upright position first to return the intestine and omentum. The castration is then performed in the usual manner and after the testicle is removed about three stitches are taken with silk thread or catgut across the opening of the canal into the scrotum. This is easily accomplished with a half-curved needle. As a matter of safety, stitches are then placed in the skin opening.

In the cryptorchid, or boar with the testicles in the abdomen, the operation is performed the same as for spaying the sow, using the method to be described.

SPAYING

Spaying is performed for the same reason as castration, and, while it was practiced quite generally twenty years ago, it is seldom done now. The necessity for the operation has passed away. It is an operation that is profitable where sows are to be kept until a year or more of age. Under the present method of marketing at eight and nine months it is more profitable to permit the sows to advance to one or two months' pregnancy rather than spay and lose a short time in checked growth and run the risk of a little loss.

When it is decided to spay the pigs are prepared for the operation as for castration. They should weigh from fifty to eighty pounds. The pig is caught and held by two men, upon an inclined board, the head being lowest. The operator stands at the back and clips the hair from the flank over a space about two inches wide and three inches long. An incision is made about midway between the point of the hip and last rib and an inch below the points of the lumbar vertebrae. The incision should be just sufficiently large to admit the finger. The forefinger of the left hand is introduced and follows the back. The ovaries will be found almost directly downward, suspended by a short ligament. They will feel like a raspberry or blackberry and can be mistaken for nothing else. If the ovary can not be found at once, pass the finger backward toward the bladder and search for the uterus (pig bed) and follow it forward to its termination at the ovary. Remove the ovary by tearing it off with the finger or cutting it off with dull scissors. The lower ovary may be removed through the same opening. Close the outside wound with two stitches, using silk thread or silk fishing line.

The operation may be performed through the middle line of the belly the same as in spaying the bitch. The method is to hang the pig up by a gambrel with a loop for each hock, make the incision about two inches in front of the pubis and remove the ovaries as already indicated. This opening is closed by two sets of stitches, one in the deep muscles and a second in the skin. One of the objections to this method is the danger of small hernias.

In either method the part should be prepared by washing with carbolic acid and the hands and instruments should be clean. The loss from operating is slight.

RUPTURE OR HERNIA.

Rupture or hernia is almost always umbilical or scrotal and is due to the omentum or intestines passing through an opening in the abdominal wall into a sack just beneath the skin. A rupture may occur anywhere about the abdomen as a result of an accident, but occurs at the above

mentioned points because there is a natural weakness and oftentimes incomplete development at those points. In case of the umbilical hernia the two abdominal muscles remain apart and in the case of the scrotal hernia the intestines follow the cord through an open canal into the scrotum.

The treatment of hernia is simple. In case of umbilical hernia turn the pig upon the back and gently return the contents of the sack into the abdomen. The point of the finger will easily detect and determine the size of the hole. Cut down upon the sack and take as many stitches from muscle to muscle as may be necessary to close the opening. There are other methods of closing the opening of this sack, but this I consider the surest. Afterward stitch the skin.

In the treatment of the scrotal hernia hang the pig up by the hind feet, return the intestines and omentum and proceed as described under castration of a ruptured pig. In case the intestines can not be returned by simply turning the pig over or holding it up and manipulation, then the openings may be enlarged with the knife, using care not to injure the intestines, and proceed as before. The operation must be done with care, wash the parts thoroughly with carbolized water, have the instruments clean and the hands clean. When carefully done, using such precautions, the loss is very low.

ENLARGED PREPUCE.

A condition often seen in the male is the enlarged prepuce. It is more prone to come on after four months than before and very much resembles a hernia. This is due to a collection of secretions and dirt in the side folds of the prepuce, afterwards becoming infected, and forming pus. The pus may become cheesy and remain there indefinitely. Sometimes the enlargement becomes so great as to cause difficulty in urination.

This condition is readily relieved by incising both sides of the prepuce and evacuating the contents. Recovery is prompt, but a recurrence may take place at a later date.

INJURIES.

Pigs are especially liable to injuries—such as fractures of the legs and crushed feet as a result of being stepped upon by the mother. All injuries should be treated the same as in other animals and the outcome will be surprisingly good. In the majority of cases of broken legs all that is necessary is to return the limb to a normal position, keep the pig in a pen where it can not be disturbed and it will unite promptly. There will be some deformity, but the leg will be serviceable. If there is such separation that a splint is required this may be made of sole leather. Take a piece of sole leather and soften it by soaking in warm water,

mould it to the limb and then allow it to dry. When dry it will become stiff and if lightly bound on will make an excellent support. Another excellent material for splinting is the veneer butter and meat plates, obtainable at all groceries. These are soaked until soft and moulded and bound on. A good splint can also be made by taking pieces of muslin a couple of inches wide and as many yards long and soaking in laundry starch and rolling on and allowing to set. A dry bandage is applied before the wet bandage is rolled on. All these materials are always available, and if the owner has any ingenuity he can make a neat-fitting, light splint that will serve the purpose in almost any condition that may arise. Injuries to the feet should be treated by occasional applications of creolin or carbolic acid and keeping the pig in a dry pen. Other injuries should be treated as they would be in the human subject.

Statistics Showing the Number of Hogs Produced, the Number Lost, and Percentage of Loss.

COUNTY.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1893.	1895.	1896.	1897.	1898.	1899.	Aver- age.	No. of Hogs
Adams—Total number.....	41,723	44,198	57,035	53,448	47,234	47,102	49,881	56,510	36,727	40,918	44,183	51,154	42,858	47,151	47.151	131
Total died.....	2,955	4,040	2,461	3,564	4,448	4,513	3,030	4,183	2,704	3,714	4,530	10,484	11,127	4,758	4.758	
Per cent. died.....	7.1	9.1	4.3	6.9	9.9	9.5	6.1	7.4	7.0	9.1	10.2	20.5	25.9	10.0	10.0	
Allen—Total number.....	67,915	69,773	.....	74,514	69,992	63,212	68,180	69,897	39,642	47,857	59,164	60,169	57,898	57,531	57.531	86
Total died.....	3,561	5,352	3,225	19,168	14,913	4,600	3,768	3,030	2,619	4,092	6,216	7,369	17,028	7,303	7.303	
Per cent. died.....	5.2	7.7	.....	25.7	21.3	7.3	5.5	4.3	7.0	8.6	10.5	12.2	29.4	12.7	12.7	
Bartholomew—Total number.....	37,594	39,473	44,377	50,624	55,404	49,196	43,018	45,301	30,351	38,618	41,252	42,046	38,625	42,765	42.765	91
Total died.....	8,242	3,536	4,088	4,103	4,180	4,396	2,232	2,175	4,709	4,014	13,168	7,862	7,652	5,412	5.412	
Per cent. died.....	21.9	9.0	9.2	8.1	7.6	8.9	5.2	4.8	15.5	10.4	31.9	18.7	19.8	12.6	12.6	
Benton—Total number.....	31,578	53,439	44,862	56,412	52,887	49,653	29,887	31,942	23,255	22,301	23,085	29,169	24,045	36,394	36.394	97
Total died.....	3,210	2,510	2,718	7,214	3,880	2,884	1,423	2,480	3,258	8,342	6,411	2,598	3,091	3,848	3.848	
Per cent. died.....	10.2	4.7	6.1	12.7	7.3	5.8	4.8	7.7	14	37.2	27.7	8.9	10.3	10.6	10.6	
Blackford—Total number.....	19,547	20,564	23,151	27,081	29,595	26,639	.....	26,077	18,669	19,681	18,179	23,727	20,003	20,985	20.985	117
Total died.....	1,025	1,552	1,023	1,667	4,229	3,582	.....	537	2,804	1,839	1,699	4,405	4,014	2,190	2.190	
Per cent. died.....	5.2	7.5	4.4	6.2	14.3	13.4	.....	2.1	15.0	9.4	9.3	18.6	20.0	10.4	10.4	
Brown—Total number.....	10,287	13,243	14,677	10,678	12,299	15,712	10,360	11,113	8,622	9,657	13,413	11,679	10,939	11,745	11.745	37
Total died.....	357	305	109	564	649	538	163	118	616	376	929	1,647	426	531	531	
Per cent. died.....	3.5	2.3	0.8	5.9	5.3	3.4	1.6	1.1	7.0	3.9	6.9	14.1	3.9	4.5	4.5	
Boone—Total number.....	73,360	79,710	82,039	77,954	96,885	83,390	79,340	81,509	71,968	83,293	104,071	88,500	78,129	83,081	83.081	198
Total died.....	5,333	4,405	4,253	7,304	11,156	9,531	6,231	4,976	6,130	19,984	43,733	2,408	5,507	10,073	10.073	
Per cent. died.....	7.3	5.5	5.2	9.4	11.5	11.4	7.8	6.1	8.5	23.9	41.7	2.7	7.0	12.0	12.0	
Carroll—Total number.....	78,913	55,864	54,051	69,354	63,523	56,613	62,691	62,983	42,373	59,473	66,099	56,633	66,121	61,130	61.130	163
Total died.....	5,076	6,286	3,119	7,163	10,129	4,848	4,799	4,516	4,480	7,170	27,205	3,254	3,321	6,799	6.799	
Per cent. died.....	6.4	11.1	5.8	10.3	15.9	8.5	7.7	7.2	10.5	12.1	41.1	5.7	5.0	11.1	11.1	
Cass—Total number.....	39,985	53,134	53,372	50,586	64,173	56,013	57,916	58,136	32,555	38,511	47,396	48,260	64,821	51,145	51.145	122
Total died.....	2,913	4,674	6,206	7,630	5,786	3,735	3,716	3,860	1,464	3,332	12,235	5,284	5,753	5,127	5.127	
Per cent. died.....	7.1	8.0	11.6	15.2	9.1	6.7	6.4	6.6	4.4	8.7	25.8	10.9	9.0	10.0	10.0	

Statistics Showing the Number of Hogs Produced, the Number Lost, and Percentage of Loss—Continued.

COUNTY.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	Aver- age.	Per cent. lost.
Clark—Total number	25,229	25,171	25,126	23,042	21,929	22,489	20,985	23,323	13,935	28,955	18,707	18,067	18,578	21,988	60				
Total died	1,110	2,279	2,002	1,647	1,922	1,920	1,341	1,213	1,070	1,037	1,200	932	2,236	1,538					
Per cent. died	4.4	9.0	8.2	10.9	8.8	8.5	6.4	5.2	8.0	3.4	6.4	5.1	8.0	7.0					
Clay—Total number	24,677	32,485	30,262	28,797	30,257	31,004	36,145	32,182	17,337	33,489	35,200	29,270	27,887	29,922	82				
Total died	2,012	2,113	3,077	3,547	1,994	1,922	1,555	1,608	2,101	4,230	6,042	2,868	2,236	2,754					
Per cent. died	8.1	6.5	12.2	12.3	6.6	5.9	4.3	5.0	7.0	12.3	17.1	9.9	8.0	9.0					
Clinton—Total number	57,125	65,855	60,813	74,245	85,069	78,954	81,826	83,255	70,260	64,148	79,357	75,783	73,740	75,156	184				
Total died	6,825	4,236	4,327	6,307	11,126	3,345	3,380	2,550	5,793	16,476	33,414	4,877	6,951	5,560					
Per cent. died	11.9	6.4	6.5	7.8	12.9	4.2	4.1	2.6	8.0	25.4	42.1	6.4	9.4	7.4					
Crawford—Total number	13,146	17,787	12,456	12,754	9,828	9,399	7,730	9,475	6,144	8,400	8,873	7,626	6,391	9,847	32				
Total died	975	2,151	1,354	477	258	390	86	120	301	234	395	314	275	565					
Per cent. died	7.4	12.1	10.9	3.5	2.6	4.2	1.1	1.3	5.0	2.8	4.4	4.1	4.3	5.7					
Daviess—Total number	37,249	44,047	43,820	42,631	47,420	47,144	42,566	46,485	37,208	42,574	61,288	45,412	37,608	44,512	103				
Total died	3,917	4,820	4,598	4,595	4,600	3,149	1,933	1,680	5,400	7,411	19,039	5,244	2,113	5,236					
Per cent. died	10.5	10.9	10.5	9.7	9.7	6.7	3.5	3.6	13.8	17.2	41.1	11.5	5.6	11.8					
Dearborn—Total number	26,938	22,683	18,312	17,797	15,519	15,330	18,984	23,470	11,453	8,148	8,878	10,532	9,131	15,859	55				
Total died	650	2,040	698	1,648	647	922	863	583	1,274	620	609	599	511	897					
Per cent. died	2.4	9.0	3.8	8.6	4.2	6.0	4.0	2.5	11.1	7.6	6.7	5.7	5.6	5.6					
Decatur—Total number	48,029	52,684	51,248	45,813	56,999	52,507	54,792	51,761	26,224	36,185	42,636	48,682	47,024	47,277	127				
Total died	5,369	6,480	3,706	4,789	9,567	9,220	8,322	7,638	1,448	2,930	12,228	4,749	10,856	6,233					
Per cent. died	11.2	12.3	7.2	9.5	16.8	6.1	15.2	14.7	4.0	8.1	28.7	9.7	23.1	13.2					
Dekalb—Total number	45,710	44,279	43,750	45,993	45,279	45,586	46,944	50,081	25,838	29,956	33,457	34,657	31,763	40,248	109				
Total died	1,292	1,582	1,385	2,120	2,451	1,320	1,152	1,216	1,152	2,549	1,201	1,287	1,493	1,568					
Per cent. died	2.8	4.0	2.9	4.4	5.4	2.9	2.6	2.4	4.0	7.2	3.8	3.7	4.7	3.8					
Delaware—Total number	73,417	91,619	80,508	81,952	77,281	65,286	74,327	84,898	52,761	57,199	64,441	70,304	59,728	72,291	140				
Total died	3,485	6,200	4,091	4,995	11,569	7,115	5,448	5,455	2,201	5,550	13,453	4,001	4,350	6,716					
Per cent. died	4.7	6.1	6.2	5.7	15.0	11.0	7.4	6.4	4.0	9.1	20.9	6.4	13.9	9.3					

Dubois—Total number	24,983	30,264	29,274	24,727	29,512	24,813	26,670	31,793	22,908	24,176	27,288	26,792	23,599	26,985	62
Total died	3,243	5,726	4,475	3,739	2,723	2,691	3,566	2,594	2,990	2,833	6,761	4,782	5,877	4,010	
Per cent. died	13.2	18.1	15.3	13.3	9.2	10.0	13.4	8.1	13.0	11.3	24.7	18.0	23.0	15.0	
Elkhart—Total number	39,669	42,008	48,701	47,962	46,291	49,397	46,035	51,927	26,409	25,724	28,971	33,125	25,453	39,436	83
Total died	4,354	1,502	1,397	1,223	2,138	5,102	1,841	1,682	1,561	1,910	1,872	1,607	3,358	2,273	
Per cent. died	10.9	3.6	2.9	2.5	4.6	10.3	4.0	3.3	6.0	7.1	6.4	4.8	13.2	5.7	
Fayette—Total number	37,867	43,715	48,991	30,841	30,740	28,403	31,210	34,259	26,886	26,874	30,542	31,658	28,445	33,110	156
Total died	2,910	4,035	7,227	7,527	7,642	2,919	2,245	2,115	3,143	4,698	12,922	4,590	6,576	5,273	
Per cent. died	7.7	9.2	14.5	19.6	24.9	10.3	7.2	6.1	11.6	17.5	42.3	14.5	23.1	13.6	
Floyd—Total number	7,390	9,328	6,607	6,112	7,061	6,968	7,677	12,476	3,654	4,774	5,027	4,380	3,633	6,697	46
Total died	347	427	375	766	191	125	133	71	252	343	372	297	251	304	
Per cent. died	4.7	4.1	5.7	11.1	2.7	1.8	1.7	.6	7.0	7.2	7.4	6.9	6.9	4.6	
Fountain—Total number	47,688	67,573	54,551	54,392	62,906	60,621	56,959	58,710	43,465	44,881	52,182	47,366	44,802	53,546	134
Total died	5,911	3,068	3,051	7,039	11,963	3,570	1,451	1,603	7,573	8,761	18,957	4,459	5,992	6,415	
Per cent. died	12.4	4.5	5.6	11.5	19.2	6.0	2.5	2.7	17.4	19.5	36.3	9.4	13.4	12.0	
Franklin—Total number	40,258	41,655	40,316	34,871	43,696	39,842	38,598	36,218	25,793	25,197	30,019	31,443	27,821	35,056	88
Total died	4,853	6,257	3,698	2,824	9,201	5,387	9,159	3,250	2,616	2,317	7,883	7,087	5,599	5,395	
Per cent. died	12.1	15.0	9.2	7.5	21.1	14.0	23.7	9.0	10.1	8.1	26.2	22.5	20.1	15.4	
Fulton—Total number	36,910	35,071	33,032	31,731	39,877	39,072	40,729	42,528	23,896	24,519	32,803	39,153	36,938	35,097	95
Total died	2,426	4,408	2,433	2,048	6,926	4,231	4,227	2,680	1,166	1,371	3,078	4,938	17,117	4,394	
Per cent. died	6.6	12.6	7.5	6.1	17.4	10.9	10.3	6.3	5.0	5.6	9.4	12.6	46.3	12.5	
Gibson—Total number	47,710	49,897	58,739	48,941	66,521	66,973	58,461	56,308	48,861	54,200	57,541	42,962	39,001	53,547	113
Total died	6,742	7,548	10,549	22,191	10,471	10,073	5,816	6,730	12,839	14,345	17,183	6,503	4,815	10,446	
Per cent. died	14.1	15.1	17.9	31.2	15.8	14.9	10.0	12.0	26.2	26.5	29.3	15.1	12.3	19.5	
Grant—Total number	79,797	95,137	91,507	86,463	96,249	86,070	82,475	85,256	57,549	59,004	75,208	67,488	69,146	79,350	190
Total died	5,837	6,149	5,975	12,153	18,513	8,456	2,245	2,875	3,389	7,743	26,594	6,107	13,578	9,233	
Per cent. died	7.4	6.5	6.4	12.3	19.3	9.9	2.7	3.4	6.0	13.8	35.4	9.0	19.0	11.6	
Greene—Total number	37,277	47,073	44,738	45,719	47,916	45,942	51,377	56,403	35,062	46,239	49,890	36,952	38,640	44,864	83
Total died	2,129	5,482	8,599	5,635	4,738	2,530	2,064	3,255	2,858	5,816	23,315	2,911	3,044	5,567	
Per cent. died	5.7	11.6	19.2	11.0	9.9	5.5	4.0	5.7	8.1	12.5	46.7	7.9	7.8	10.7	
Hamilton—Total number	71,769	88,610	87,908	79,317	95,323	88,845	86,793	85,942	61,377	70,893	80,195	77,596	72,912	80,575	201
Total died	5,681	5,251	9,740	9,593	11,177	4,820	3,644	3,180	8,512	17,866	27,232	5,046	11,930	9,513	
Per cent. died	7.9	5.9	11.1	12.1	11.7	5.4	4.1	3.7	13.8	25.2	34.0	6.4	16.3	11.8	
Hancock—Total number	56,696	65,261	68,985	67,986	58,191	52,109	62,605	65,143	47,482	46,872	61,579	61,031	89,790	61,825	201
Total died	2,703	3,559	2,305	4,560	11,549	3,386	4,331	4,122	3,643	10,666	27,595	8,195	18,063	8,052	
Per cent. died	4.8	5.5	3.3	6.3	19.7	6.5	6.8	6.3	8.0	22.8	44.8	13.4	20.1	13.0	

100—ACR.

BOARD OF AGRICULTURE.

Statistics Showing the Number of Hogs Produced, the Number Lost, and Percentage of Loss—Continued.

COUNTY.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1895.	1896.	1897.	1898.	1899.	Aver. age.	Sq. Mile per Co.
Harri-on—Total number.....	31,135	37,560	39,694	29,538	30,799	30,710	30,994	35,491	22,854	21,522	24,873	22,380	18,199	28,443	60
Total died.....	2,741	3,190	2,518	3,434	1,833	1,453	1,049	1,130	1,701	1,220	2,013	1,954	1,630	1,974	
Per cent. died.....	8.8	8.0	8.2	10.4	5.3	4.7	3.4	3.2	7.4	5.0	8.0	8.8	9.0	7.0	
Hendricks—Total number.....	60,216	77,453	66,642	60,145	52,981	78,585	88,839	87,817	57,011	67,069	76,151	72,729	70,460	72,764	186
Total died.....	2,513	5,808	6,947	6,780	1,354	4,598	2,973	3,110	5,678	11,058	26,562	8,436	6,397	7,786	
Per cent. died.....	4.2	7.5	10.4	1.1	12.5	5.9	3.3	3.5	9.7	16.5	34.9	11.6	9.0	10.7	
Henry—Total number.....	98,722	94,373	97,799	96,119	96,736	62,887	87,341	82,785	61,032	77,766	70,140	74,219	80,759	79,283	198
Total died.....	10,831	5,357	6,347	6,015	10,527	8,570	6,667	6,940	3,583	28,260	19,478	6,873	9,415	9,913	
Per cent. died.....	12.2	9.9	6.5	6.5	15.8	13.6	7.6	8.4	6.0	36.3	27.8	9.2	11.8	12.5	
Howard—Total number.....	50,705	54,552	.....	56,122	61,974	60,004	61,717	62,886	50,087	53,216	65,782	68,112	63,481	54,534	185
Total died.....	5,564	7,699	.....	4,652	9,240	6,871	3,661	2,870	10,167	10,312	16,607	6,873	7,756	7,144	
Per cent. died.....	11.0	14.1	.....	8.1	14.7	11.3	5.9	4.6	20.8	19.4	25.2	9.0	12.2	11.6	
Huntington—Total number.....	60,659	61,364	61,483	59,344	64,205	60,275	65,137	70,817	49,170	41,328	49,126	52,894	49,605	57,572	150
Total died.....	2,462	6,994	3,112	4,139	12,694	6,385	4,777	3,866	3,104	6,343	9,387	5,486	11,875	6,202	
Per cent. died.....	4.6	11.2	5.1	6.5	19.8	10.6	7.2	5.5	6.3	14.3	18.9	10.4	24.0	10.8	
Jackson—Total number.....	35,334	40,224	43,017	45,411	42,837	38,794	38,113	43,626	26,273	35,795	35,785	33,578	30,358	37,619	77
Total died.....	936	4,128	5,497	4,412	6,347	2,682	1,804	2,108	1,443	2,199	9,699	6,258	6,315	4,141	
Per cent. died.....	2.7	10.3	12.8	8.9	14.8	6.9	5.0	4.8	5.4	6.1	27.9	18.6	20.8	11.0	
Jasper—Total number.....	.....	21,237	23,538	22,248	34,435	29,222	24,616	27,72	13,123	18,436	24,289	27,681	29,429	24,702	45
Total died.....	936	948	1,899	616	862	677	472	651	5,656	5,176	1,470	1,321	5,812	2,038	
Per cent. died.....	.....	4.5	8.1	2.7	2.2	2.3	1.9	2.4	19.7	27.3	6.1	4.8	19.8	8.9	
Jay—Total number.....	52,616	56,405	49,465	51,893	67,409	68,514	79,786	74,645	38,800	40,164	49,926	52,143	52,175	56,437	150
Total died.....	1,969	7,087	3,186	3,635	2,835	8,592	2,740	2,269	3,107	2,843	8,288	4,748	15,500	4,768	
Per cent. died.....	3.7	10.8	6.5	6.6	4.2	5.2	3.5	2.9	8.0	7.0	16.6	9.1	29.7	8.4	
Jefferson—Total number.....	12,187	26,275	23,886	18,915	12,645	17,346	15,897	19,184	14,175	17,204	17,292	19,829	16,108	18,834	47
Total died.....	1,036	1,069	1,062	911	944	664	841	421	873	913	1,363	981	1,377	980	
Per cent. died.....	8.5	4.2	7.1	4.8	5.4	3.8	2.1	2.2	6.0	5.0	7.8	5.0	8.5	5.3	

Jennings—Total number	2,630	22,131	23,099	21,744	24,891	23,909	23,780	24,198	12,394	17,006	19,570	21,087	19,721	21,126	56
Total died .....	.....	1,103	964	1,176	1,684	1,136	1,010	897	795	852	1,599	1,576	2,165	1,353	
Per cent. died .....	.....	5.0	4.2	5.4	6.8	4.8	4.2	3.7	6.4	5.0	8.1	7.0	11.0	7.0	
Johnson—Total number	73,414	68,204	72,800	71,766	54,165	50,832	60,468	64,725	47,494	54,152	61,651	66,879	55,719	61,251	196
Total died	2,447	3,677	4,237	10,726	10,096	3,665	3,107	4,116	5,904	14,126	18,568	6,448	10,697	8,296	
Per cent. died	3.3	5.4	5.8	14.9	18.7	7.3	5.1	6.4	12.4	26.1	30.5	9.6	19.2	13.5	
Knox—Total number	39,310	46,692	55,113	57,269	66,433	62,458	69,764	61,319	53,292	54,087	51,888	49,978	40,928	54,501	100
Total died	5,469	5,785	9,313	8,589	10,126	9,611	7,915	8,403	21,287	22,800	11,789	4,338	7,169	10,253	
Per cent. died	14.0	12.4	16.9	15.0	15.3	15.4	11.3	14.0	39.9	42.1	22.7	9.0	17.5	18.9	
Kosciusko—Total number	57,341	59,443	55,784	57,420	57,379	63,334	83,265	80,419	32,632	38,364	45,704	60,676	44,233	56,615	101
Total died	2,236	1,303	1,004	1,329	439	2,679	7,915	2,255	2,842	2,033	1,982	3,840	9,637	3,038	
Per cent. died	3.9	2.2	1.8	2.3	0.8	4.2	9.5	2.8	9.0	5.0	4.3	6.3	21.8	5.3	
Lagrange—Total number	42,348	48,330	39,948	41,916	43,040	43,500	43,402	45,844	21,219	26,968	31,480	34,700	27,708	37,723	97
Total died	2,191	3,196	1,286	999	896	1,017	1,288	1,457	957	1,026	1,292	1,932	1,284	1,448	
Per cent. died	5.2	6.6	3.2	2.4	2.1	2.3	3.0	3.2	5.0	4.0	4.6	5.5	4.6	3.9	
Lake—Total number	28,853	24,824	25,559	25,482	22,197	20,841	23,555	23,238	11,838	15,090	16,398	16,425	15,607	10,762	21
Total died	2,191	1,606	635	853	706	713	683	690	1,312	2,051	1,197	1,961	2,194	1,307	
Per cent. died	7.6	6.5	2.5	3.4	3.2	3.4	2.9	3.8	11.0	13.5	7.3	12.0	14.0	6.3	
Laporte—Total number	51,035	43,645	56,062	41,789	48,932	37,263	37,743	40,551	20,453	24,102	25,322	29,582	23,858	36,951	68
Total died	3,106	5,968	5,853	2,543	11,686	4,811	1,573	1,820	1,386	3,770	5,104	3,604	5,012	4,326	
Per cent. died	6.1	13.7	10.4	6.1	23.9	12.9	4.2	4.5	7.0	15.6	20.1	12.2	21.0	11.1	
Lawrence—Total number	23,663	32,831	32,357	25,549	26,655	25,460	27,594	29,085	19,696	21,598	24,188	19,400	27,237	25,793	59
Total died	1,391	2,131	1,627	1,243	1,969	1,798	2,023	974	959	1,510	6,647	2,636	1,451	2,028	
Per cent. died	5.9	6.5	5.0	4.9	7.4	7.0	7.3	34.0	5.0	7.0	27.5	14.3	5.3	7.9	
Madison—Total number	65,944	.....	68,445	83,844	66,367	64,415	77,418	88,604	53,890	59,820	74,845	67,953	72,685	70,352	158
Total died	3,220	.....	4,052	9,112	10,789	5,371	4,017	6,294	8,529	7,787	30,774	5,811	11,366	8,510	
Per cent. died	4.7	.....	5.9	10.3	16.3	8.3	5.2	7.1	7.0	13.0	41.1	8.6	15.5	12.2	
Marion—Total number	42,300	66,309	.....	41,920	60,270	59,640	52,208	57,301	30,244	33,470	40,030	38,166	40,782	49,390	118
Total died	2,579	2,573	.....	2,058	8,710	7,540	2,049	2,625	5,578	6,624	15,336	2,791	8,501	5,605	
Per cent. died	6.1	4.5	.....	4.9	14.3	12.6	4.9	4.6	18.4	19.8	38.3	7.3	20.8	11.3	
Marshall—Total number	43,980	42,177	40,243	41,920	60,115	59,603	58,753	54,794	31,869	35,790	40,223	43,293	33,191	44,936	102
Total died	5,732	4,163	2,986	2,058	3,636	4,458	4,717	5,628	1,784	2,876	5,391	6,097	8,297	4,525	
Per cent. died	13.0	9.9	7.4	4.9	6.4	7.5	8.0	10.3	6.0	8.0	13.4	14.1	25.0	9.9	
Martin—Total number	18,437	25,451	20,859	20,696	25,114	27,102	17,848	17,354	12,883	15,650	18,840	15,929	15,991	19,435	60
Total died	1,138	4,105	2,269	1,024	940	1,996	1,236	1,376	911	1,185	4,712	2,724	1,198	1,909	
Per cent. died	6.2	16.1	10.9	4.9	3.7	7.4	7.0	7.7	7.0	7.5	25.0	17.1	7.5	9.8	

BOARD OF AGRICULTURE.

Statistics Showing the Number of Hogs Produced, the Number Lost, and Percentage of Loss—Continued.

COUNTY.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1895.	1896.	1897.	1898.	1899.	Aver- age.	No. of Hogs
Miami —Total number	60,313	67,167	66,413	69,528	79,177	74,153	74,293	75,074	41,539	42,682	53,847	46,792	50,784	61,669	161
Total died	4,543	7,588	6,006	4,717	17,619	9,973	4,704	2,748	3,404	3,649	17,245	4,704	5,877	7,183	
Per cent. died	7.5	11.1	9.9	6.8	22.3	13.4	6.3	3.7	8.1	8.0	32.0	10.0	11.8	11.6	
Monroe —Total number	21,364	25,832	20,632	18,502	20,744	16,166	19,048	18,452	12,872	19,351	19,833	21,692	15,482	19,233	46
Total died	1,130	1,161	1,061	1,098	755	930	347	371	1,109	1,780	3,766	2,131	1,155	1,292	
Per cent. died	5.3	4.5	5.1	5.9	3.6	5.7	1.8	2.0	9.0	10.0	18.9	10.0	7.5	6.7	
Montgomery —Total number	48,950	56,917	104,306	108,209	113,849	106,360	101,261	97,728	82,863	96,287	95,077	100,652	88,114	91,583	182
Total died	2,119	339	1,461	5,842	15,195	11,950	5,854	5,948	13,313	37,853	27,218	10,506	14,049	11,665	
Per cent. died	4.3	.6	1.4	5.4	13.3	11.2	5.8	6.1	16.0	40.3	28.6	10.4	15.9	12.7	
Morgan —Total number	35,151	52,039	52,067	49,495	44,785	38,659	44,041	17,212	39,858	45,354	51,919	51,797	43,812	45,861	112
Total died	3,441	3,585	4,838	5,235	7,517	2,362	1,768	1,885	3,008	9,142	16,018	5,607	5,691	5,393	
Per cent. died	9.8	6.9	9.3	10.6	16.9	6.0	4.0	4.0	8.0	20.0	30.8	10.8	13.0	11.9	
Newton —Total number	21,306	22,903	24,247	23,267	20,790	19,910	28,612	29,334	13,724	16,777	18,021	22,586	19,316	21,596	57
Total died	986	766	861	1,065	576	375	1,056	970	1,717	7,032	1,104	547	3,616	1,590	
Per cent. died	4.6	3.3	3.5	4.1	2.8	1.9	3.7	3.3	12.5	37.4	6.1	2.4	18.7	7.4	
Noble —Total number	49,033	47,230	45,823	47,639	51,014	51,089	55,415	52,172	28,320	32,614	39,525	42,321	35,868	44,466	106
Total died	2,350	1,846	1,195	962	2,057	2,804	2,767	3,004	1,429	1,269	1,380	2,921	3,399	2,106	
Per cent. died	4.8	3.9	2.6	2.2	4.0	5.5	5.0	5.7	5.0	4.0	3.5	6.9	9.5	4.8	
Ohio —Total number	7,709	8,616	7,096	6,297	7,593	7,476	6,762	6,735	3,181	3,430	3,620	4,423	4,046	5,999	62
Total died	254	437	269	121	144	118	79	83	186	201	107	147	123	174	
Per cent. died	3.3	5.1	5.8	1.9	1.9	1.6	1.2	1.2	6.0	6.0	2.9	3.3	3.0	2.9	
Orange —Total number	20,515	30,825	27,150	25,336	27,238	26,083	24,515	29,012	17,175	20,231	18,581	21,295	14,811	23,297	58
Total died	1,007	2,738	2,071	1,079	904	1,649	396	656	644	616	1,494	2,567	1,675	1,368	
Per cent. died	4.9	8.9	7.6	4.3	3.3	6.3	1.6	2.3	4.0	2.0	8.4	13.5	11.3	6.9	
Owen —Total number	26,564	28,017	26,596	31,418	28,870	28,421	29,533	33,585	24,962	24,911	25,753	23,806	19,991	27,117	70
Total died	1,242	1,266	1,590	1,820	2,231	2,090	1,281	1,509	1,978	3,852	6,100	8,239	2,217	2,340	
Per cent. died	4.7	4.5	6.0	5.8	7.7	7.4	4.4	4.4	8.0	15.4	23.7	34.6	11.1	8.6	

Parke—Total number	41,285	49,212	49,866	49,535	48,156	41,499	38,024	43,784	89,398	44,184	52,239	48,190	44,231	45,363	104
Total died	4,285	3,832	5,652	5,575	9,003	2,483	1,427	1,080	4,392	8,104	15,658	4,253	2,939	5,206	
Per cent. died	10.3	7.8	7.3	11.2	18.9	6.0	3.8	2.4	11.1	18.3	29.9	8.8	9.0	11.5	
Perry—Total number	11,773	17,003	15,170	14,942	14,020	16,537	20,021	17,929	10,871	12,667	15,300	11,758	9,718	14,455	36
Total died	1,500	1,731	1,026	981	822	1,404	816	714	633	934	1,073	870	848	1,029	
Per cent. died	12.7	10.2	6.7	6.6	5.8	8.5	4.8	4.0	6.0	7.3	7.0	7.6	8.7	7.1	
Pike—Total number	29,410	40,396	40,604	36,248	42,544	38,280	37,312	37,273	25,920	33,314	32,843	30,163	23,135	34,418	105
Total died	2,054	3,137	4,659	4,514	3,672	3,124	1,822	1,950	3,050	8,759	6,376	3,337	2,902	3,797	
Per cent. died	7.0	7.8	11.5	12.4	8.6	8.2	4.9	5.2	11.7	26.3	19.4	11.0	12.5	11.0	
Porter—Total number	29,101	34,242	27,364	27,378	21,646	23,544	23,536	25,299	14,302	17,039	20,644	23,616	21,074	23,753	57
Total died	2,322	249	1,487	1,899	530	519	246	217	848	1,697	1,811	1,733	6,439	1,538	
Per cent. died	8.0	.7	5.4	6.9	2.5	2.2	1.0	.8	6.0	10.0	8.7	7.3	30.5	6.5	
Posey—Total number	29,881	24,333	35,060	37,475	35,946	34,214	31,646	33,909	32,787	32,753	31,793	38,455	23,537	32,445	77
Total died	3,319	3,640	7,738	4,072	5,070	3,502	2,539	4,560	12,777	11,000	10,140	5,933	3,735	6,002	
Per cent. died	11.1	15.0	22.1	10.9	14.1	10.5	8.0	13.4	38.9	33.5	31.9	20.9	15.9	10.8	
Pulaski—Total number	23,550	18,127	22,764	21,521	22,570	23,981	21,487	18,370	11,536	17,870	22,259	32,540	19,917	21,269	50
Total died	1,090	996	795	830	1,073	512	1,020	425	866	1,642	1,111	2,803	3,570	1,287	
Per cent. died	4.6	5.5	3.5	3.9	4.7	2.1	4.7	2.3	8.0	9.2	5.0	8.6	18.0	6.0	
Putnam—Total number	51,238	52,748	51,879	54,448	64,410	62,972	57,718	56,226	53,784	62,604	65,778	65,910	82,180	63,176	130
Total died	2,253	1,673	2,694	3,198	3,394	3,762	1,722	1,890	4,186	7,922	19,879	6,600	5,821	4,500	
Per cent. died	4.4	3.2	5.2	5.8	5.1	6.0	3.0	3.4	8.0	12.6	30.2	10.0	9.1	7.9	
Randolph—Total number	84,858	96,432	78,287	77,743	93,301	84,541	93,467	95,882	56,203	66,655	71,032	75,647	65,475	79,663	180
Total died	7,634	19,531	10,022	7,507	10,190	7,510	11,702	10,970	3,262	4,614	8,977	12,294	15,466	9,975	
Per cent. died	9.0	20.3	12.8	9.7	10.9	8.3	12.5	11.4	5.3	6.9	12.6	16.2	23.6	12.5	
Ripley—Total number	23,189	33,976	25,366	22,818	24,438	23,580	23,525	26,967	16,573	17,688	21,350	28,082	24,234	23,937	53
Total died	1,143	1,578	1,109	792	658	669	674	633	966	1,039	1,816	4,664	2,483	1,402	
Per cent. died	4.9	4.6	4.4	3.5	2.7	2.8	2.9	2.4	6.0	5.8	8.5	16.3	10.0	6.0	
Rush—Total number	100,281	114,007	90,513	88,565	94,337	84,050	84,129	81,795	71,474	84,197	92,479	87,972	81,769	88,890	214
Total died	8,492	20,294	8,418	9,637	17,053	7,450	5,459	4,860	2,661	36,717	32,153	8,076	18,016	9,074	
Per cent. died	8.0	17.8	9.3	10.9	17.1	8.9	6.5	5.9	4.0	43.6	35.3	9.0	22.0	10.2	
Scott—Total number	10,567	12,065	10,769	10,272	10,273	9,861	9,459	10,759	7,227	9,028	7,217	17,701	9,869	9,697	45
Total died	981	667	395	395	462	316	308	384	485	466	767	511	486	510	
Per cent. died	9.3	5.1	3.7	3.8	4.5	3.2	3.3	3.6	8.0	5.1	10.6	3.0	5.0	5.3	
Shelby—Total number	52,669	56,580	66,052	65,800	55,338	52,860	58,634	63,820	45,885	55,660	59,570	54,034	59,855	57,848	141
Total died	6,491	6,162	5,360	7,366	8,295	3,748	2,556	4,552	3,038	19,378	23,482	5,519	16,777	8,671	
Per cent. died	12.3	10.8	8.1	11.2	15.0	7.1	4.0	6.6	7.0	38.8	40.0	10.2	28.0	15.0	

BOARD OF AGRICULTURE.

Statistics Showing the Number of Hogs Produced, the Number Lost, and Percentage of Loss—Continued.

COUNTY.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1895.	1896.	1897.	1898.	1899.	Aver- age.	Prod- uct
Spencer—Total number.....	25,578	31,606	29,791	29,263	26,765	27,132	29,996	29,424	18,218	21,169	24,417	22,455	25,458	26,251	53
Total died.....	2,098	2,524	2,411	1,820	1,489	1,687	2,215	2,580	1,233	1,312	1,911	2,365	2,817	1,036	
Per cent. died.....	8.2	8.0	8.0	6.2	5.6	6.2	7.4	8.8	6.2	6.2	7.8	10.5	11.0	7.7	
Starke—Total number.....	5,409	4,387	6,157	6,320	6,486	7,298	6,664	6,218	3,637	5,674	7,120	8,575	7,245	6,245	20
Total died.....	628	542	360	377	467	944	416	243	148	981	856	884	653	577	
Per cent. died.....	11.6	12.4	5.8	6.0	7.2	12.9	6.2	4.0	4.0	17.3	12.0	10.3	9.0	9.2	
Steuben—Total number.....	39,849	39,974	39,885	39,571	42,347	41,952	42,856	40,303	20,539	22,040	26,879	30,112	24,876	34,706	104
Total died.....	1,292	1,472	1,069	610	599	709	2,367	2,550	558	435	449	856	3,106	1,234	
Per cent. died.....	3.2	3.7	2.5	1.6	1.4	1.7	5.5	6.3	3.0	2.0	1.7	2.8	12.9	3.5	
St. Joseph—Total number.....	37,610	41,314	46,347	36,792	40,017	31,112	36,924	39,313	19,577	18,369	20,196	22,116	22,133	31,293	70
Total died.....	3,197	3,902	2,567	1,914	5,845	3,592	1,550	1,670	1,328	1,886	2,181	1,813	1,626	2,544	
Per cent. died.....	8.6	9.4	6.2	5.2	14.6	11.5	4.2	4.3	7.0	10.2	10.8	8.2	7.3	8.1	
Sullivan—Total number.....	42,338	54,045	61,721	60,187	60,028	60,625	59,242	59,411	42,392	60,867	48,938	50,070	38,900	45,946	116
Total died.....	2,942	2,829	12,042	11,116	5,698	4,670	3,857	4,160	3,382	26,169	6,728	4,500	6,583	7,283	
Per cent. died.....	6.9	5.2	19.5	18.5	9.5	7.7	6.5	7.0	8.0	43.0	13.8	9.0	17.0	15.9	
Switzerland—Total number.....	13,066	14,634	13,505	12,145	12,528	12,502	10,687	12,688	7,316	7,356	6,967	10,523	8,018	10,920	49
Total died.....	409	342	248	113	317	235	116	117	606	249	314	444	304	283	
Per cent. died.....	3.1	2.3	1.8	.9	2.5	1.8	1.1	.9	8.2	3.0	4.5	4.1	3.8	2.7	
Tippecanoe—Total number.....	46,041	61,639	61,689	64,030	63,546	62,617	60,647	65,995	38,655	41,794	59,478	68,963	52,842	56,765	113
Total died.....	3,824	6,161	9,216	9,978	5,556	4,302	3,373	4,070	3,289	6,797	23,447	4,286	7,995	7,100	
Per cent. died.....	8.3	10.0	14.9	15.9	8.8	6.9	5.6	6.2	9.0	16.2	39.4	7.1	15.1	12.5	
Tipton—Total number.....	39,312	41,185	45,887	50,214	61,201	50,718	57,040	63,393	45,188	53,615	60,697	51,150	46,840	51,187	197
Total died.....	3,905	3,902	5,641	7,329	5,151	2,806	2,367	4,080	1,423	9,151	21,859	5,928	9,118	6,386	
Per cent. died.....	10.2	9.5	12.1	14.6	8.9	5.5	4.1	6.4	3.1	17.6	36.0	11.6	19.5	12.5	
Union—Total number.....	29,686	32,848	33,532	33,743	30,845	27,901	24,757	27,850	20,171	25,412	30,720	33,637	27,645	29,187	172
Total died.....	2,013	4,400	1,765	2,487	5,895	8,860	2,446	1,920	1,217	2,615	7,214	6,142	7,476	3,811	
Per cent. died.....	6.8	13.4	5.3	8.6	19.4	13.8	9.1	7.0	6.0	10.2	23.5	18.0	27.0	13.2	

Vanderburgh—Total number	13,972	16,750	16,681	15,810	16,006	16,973	16,877	18,293	11,544	10,928	11,309	10,741	9,759	14,272	59
Total died	1,088	1,282	1,357	1,583	1,944	1,962	2,528	3,020	1,268	1,683	2,177	1,181	1,098	1,615	
Per cent. died	7.8	7.6	8.1	9.9	8.7	7.1	14.9	16.5	10.9	15.5	19.2	11.0	11.2	11.3	
Vermillion—Total number	24,614	31,792	30,201	33,627	34,741	30,413	33,810	36,187	21,587	23,154	22,881	25,311	22,767	28,553	115
Total died	2,910	3,277	3,818	6,438	4,948	1,893	1,294	2,118	1,571	6,840	5,032	2,927	2,593	3,534	
Per cent. died	11.8	10.3	12.6	19.1	14.0	6.2	3.8	5.6	9.1	29.5	22.0	11.6	11.4	12.4	
Vigo—Total number	21,005	35,793	38,079	41,240	39,614	35,488	38,997	39,039	24,571	30,890	31,314	29,056	23,749	32,986	83
Total died	1,872	2,879	4,464	10,228	4,576	2,491	1,982	3,456	1,905	6,191	4,616	3,389	2,253	3,869	
Per cent. died	7.6	8.1	11.7	24.8	12.2	7.0	5.1	8.8	8.0	20.0	14.8	11.7	9.5	11.7	
Wabash—Total number	73,666	74,621	71,228	73,896	73,108	68,495	75,423	74,690	41,401	38,851	41,449	55,017	48,628	62,321	146
Total died	4,864	4,196	3,294	5,961	8,857	7,152	6,554	5,890	5,660	4,146	4,824	7,797	7,633	5,911	
Per cent. died	6.6	5.6	4.6	8.5	12.1	10.4	8.7	7.9	13.6	10.6	11.2	14.2	15.7	9.5	
Warren—Total number	41,171	44,982	34,067	34,962	47,908	35,478	38,777	41,144	25,191	41,085	33,908	37,681	42,546	38,370	105
Total died	6,225	2,750	2,726	3,623	5,188	3,440	1,109	832	2,893	16,727	7,615	3,252	3,849	3,234	
Per cent. died	15.1	6.1	8.0	10.4	10.8	9.7	3.0	2.0	8.2	41.0	22.5	8.6	9.0	8.8	
Warrick—Total number	28,928	30,042	31,909	29,821	28,472	28,136	34,272	38,721	21,376	26,238	25,051	27,168	25,829	28,920	59
Total died	2,457	2,448	3,407	2,214	3,209	1,874	1,386	6,513	1,653	1,906	2,133	2,813	1,439	2,574	
Per cent. died	9.2	8.1	10.7	7.4	11.3	6.6	4.1	16.9	8.0	7.0	8.5	10.3	5.5	9.0	
Washington—Total number	32,912	40,135	33,530	33,950	32,919	34,182	41,140	39,062	25,903	30,422	36,018	38,459	34,811	34,488	67
Total died	1,443	1,195	2,336	2,756	1,644	953	828	1,880	1,025	1,485	3,947	1,534	1,549	1,745	
Per cent. died	4.4	3.0	7.0	8.1	5.0	2.7	2.0	4.8	4.0	5.0	11.0	4.9	4.4	5.6	
Wayne—Total number	91,027	86,161	70,920	78,712	80,842	80,900	74,948	78,105	49,100	44,675	57,165	59,461	60,280	70,179	176
Total died	9,253	11,647	9,808	7,730	11,479	10,801	11,598	11,074	3,541	4,313	16,125	6,795	14,788	9,920	
Per cent. died	10.2	13.5	13.8	9.9	14.2	13.3	15.5	14.5	7.2	9.0	28.2	11.1	24.5	14.1	
Wells—Total number	58,549	59,490	59,160	67,000	67,200	67,120	73,235	73,934	43,540	50,302	56,167	63,085	67,933	62,052	362
Total died	2,774	6,098	2,114	4,032	6,402	6,141	3,858	5,184	1,733	2,792	4,100	8,143	27,693	6,205	
Per cent. died	4.7	10.3	3.6	6.0	9.5	9.1	5.2	7.0	4.0	5.5	7.3	13.0	40.8	10.0	
White—Total number	32,247	28,982	28,064	25,698	33,966	35,286	38,836	41,717	23,193	30,316	38,448	43,997	38,809	33,805	67
Total died	1,128	977	694	796	2,838	1,517	973	1,024	2,743	3,220	7,255	2,777	5,112	2,404	
Per cent. died	3.5	3.4	2.5	3.1	8.3	4.3	2.5	2.4	11.8	10.6	18.8	6.3	13.2	7.1	
Whitley—Total number	41,591	42,341	40,135	41,152	44,634	44,514	45,273	47,265	22,683	26,720	31,165	32,019	29,271	39,141	116
Total died	1,883	2,271	1,805	1,861	2,778	2,751	2,832	2,801	1,962	2,267	2,160	2,145	3,476	2,384	
Per cent. died	4.5	5.4	4.5	4.5	6.2	6.2	6.2	5.9	9.0	8.5	6.9	6.7	11.8	6.9	

"PIG GROWING"—SUGGESTIONS TO BEGINNERS.

BY JNO. M. JAMISON, ROXBELL OHIO

Every year, from various causes, men abandon pig growing. Consequently there must constantly be new beginners taking their place to meet the constantly increasing demand for this product of the corn belt. The beginner can rest assured of one fact, he can always get his share of this work, for hog growing can not be monopolized by a few men. As a living creature, trusts have not been able to control his number or the period of his existence. Nor are politicians able to legislate him out of existence. Dread disease is the only breaker that confronts the beginner, as well as the experienced grower.

High prices of the product are an increasing stimulus to cause men to start in the business. Many start under this encouragement that would not otherwise give the matter any attention, hence many of them fail because they have no pleasure in caring for the pigs.

The beginners, under low prices, are more apt to be successful, because they select this branch of stock farming on account of their tastes running in that direction. For the beginner to succeed and stick to the pig through thick and thin, he should have some liking for him, should take pleasure in seeing the little fellows as soon as they are born turn their attention to the business of their lives, that of hunting something to eat, and to such an one there should be much music in the first cracking of corn by the little beauties.

And while they are as alike as two peas to the stranger, to the pig lover every one should have an individuality and be to some extent different from his fellows.

The beginner should start with good stock. Good pure breed stock can be had at living prices, and at these prices are as good for growing pork pigs as the "Crackerjacks and Jim Dandies" that must be bought at a long price.

Or, if the beginner is uncertain what breed he fancies, let him select good native sows of mixed breeding and a pure-bred boar of good quality. No difference how cheap a cross-bred boar may be bought, or how promising an animal he may be, we can not advise a beginner to start with such. Using a boar of uncertain or mixed breeding is like putting a bad, soft stone in a foundation. It is well to remember that the male gives the form, and the purer his breeding the more certain he is to reproduce himself.

It is natural for the beginner to spend much time in building air castles. Now we will not condemn this, for there is much pleasure in it, but we would advise that when these castles go to pieces, the pleasure

had in building them be remembered and no time wasted in contemplating the ruins. A common error with the beginner is to start with too many. Much better begin in a small way than to start with more than can be handled. It is not always safe to assume that because two or three sows do remarkably well a dozen or more with the same surroundings and territory will do equally so. Some men in this, as in other matters, have greater capability than their fellows, and can do more from the start. But no one can know his capability or ability at the beginning, for it is not altogether measured by the opportunity they have to give the pig a chance.

Say we have the stock and feed, then we come to the care. A finely bred pig will degenerate more rapidly under mean treatment than a scalawag. It is unwise to assume that because a pig is finely bred that it will take less to feed him than it will one of poor quality in form and blood. Rather, it will take more and better feeding, but he will return more for what he eats. At farrowing time the sows should have comfortable, warm quarters, where the temperature can be kept below freezing, if it is zero or below on the outside.

This can be done easily on any well-appointed farm, and there the sow should be so tame that when her owner goes to see how she is getting on, there will be no show of fight, but rather a welcome in her way of talking, calling attention to her nice family and inviting inspection. Only yesterday we went into a six-foot square house and counted a litter of nine, and by the mother's actions it could not have been told that she noticed us.

A few days ago we went into a pen with a sow weighing about 400 pounds and thought she was lying a little too close to side of nest for the comfort of the pigs. We put one hand under her in front of her hind quarters, and the other over, pulling on her and moving her as far as we wished, and this without causing her to get up. Under these conditions a beginner is able to get along much better than to be compelled to reach the pigs with a ten-foot pole.

Then when the pigs are counted don't rush to feed the sow corn or anything else. About all she wants for twenty-four hours is a good drink or two of pure water and the society of her family. Give attention to her and she will show by her actions when she begins to crave food. Then feed lightly of rich food, and try to give such other food as will allay hunger and not heat her system too much. Feed foods from which the sow can make milk rich in protein. Bran and middlings, clover pasture or clover hay, blue grass, in season, pumpkins and roots in their season. The latter should be in store for all winter use. Another point: sows and pigs should have plenty of exercise. Hogs being fitted for the market should be allowed to take such exercise as they desire when properly fed, and don't get the idea that an extensive and costly hog house is a necessary part of successful hog growing. Considering the vast number of hogs

grown, comparatively few costly houses are in use. As a rule, when tried, they have proved objectionable, because of difficulty in keeping them clean and disinfecting them when once disease germs have found lodgment in them. The most a pig requires is comfort in the way of house and shelter. The points to be observed to secure this are warmth, cleanliness and dryness. It makes no difference to the pig whether he finds them in a strawstack, rail pen covered with straw or fodder, or in costly houses. He is not concerned as to profits he brings his owner; this latter is the owner's part of the deal.

Another matter we would emphasize. Every beginner should be a close and diligent student of all that pertains to the pig. Not alone to all found in papers or books, but also the practical study in the lots in feeding and handling them. There is oftentimes much profit in spending a little, or even much, time in watching the pigs eat and noting carefully their habits. At feeding time know that all eat and appear thrifty; and always remember there is more in prevention than in cure. Avoid nostrums and highly lauded cures. If misfortune comes, don't give up the pig but give him another trial. However, it is not advisable to run all to pig in farm management. There is a saying that he will root his owner out of debt. Much better if he lifts the mortgage without rooting. Give the pig good care and credit for his good qualities and he will do to tie to, for he never goes back on his owner (barring disease) when well fed and housed.

WHERE AND HOW TO SELECT BREEDING ANIMALS.

BY W. ARTHUR AYRES, OAKVILLE, KY.

This is a question often asked by those that are contemplating not only going into the business of breeding swine as a specialty, but by every man that contemplates buying a hog for breeding purposes. Of course, breeders will always tell you to go to a good breeder, and they are right. First, select the kind of swine you want to breed, then consult the advertising columns of some good, reliable stock paper, for men who are engaged in the business, provided always there are no breeders of your favorite breed in your vicinity, or if such do not have what you want. But right here let me say first, and say emphatically, try home first, for your home men will always save you money.

If a man advertises pigs the year around way down low, let him alone; he has an inferior article and therefore has to sell below his brother breeder. He and the man who rarely, if ever, advertises are the men we always skip when we have to add new blood to our herd. Now, with these out of the way, you need have no fear, for breeders, as a class,

do not try to beat any man. We seldom see a hog we buy until after he gets to our place. We trust the breeder to ship what we order and pay for, and he has always done so for us, and we have been buying and selling for the last ten years. We never buy a cheap animal, for they are dear to us at any money. We never order from the men who always have "five-thousand-dollar hogs" either. We do not think this kind of an animal is produced often enough to justify us in paying over \$4,999 for one of them, for we have noticed that their fame dies with them, and for that reason do not advocate such stuff. A farmer does not want to pay over \$15 or \$25 for a pig three or four months old. We have tried to make it clear as to where to buy--from the breeder; let us look at how to buy.

Here is how we do. First, we write some good Poland-China man (of whom there are hundreds) describing what blood lines we need, asking a description and prices of stuff. We get this, make out order from it, describe minutely the animal we want, and in the end he sends us just what we want. We often think when the animal comes, "Well, that fellow did a better job than we could have done had we picked our own pig out of the herd."

If you want a boar, go to some family noted for being prolific and able to produce themselves in their offspring. He must have a short head for the breed, broad nose, broad between the eyes, heavy jowl, good hams and shoulders, a broad, strong back and loins, and above all, good room for lungs and good heart, compact build and nice finish. If he does not have good feet and legs, no matter how good everywhere else, we would not have him as a precious gift. So much for the male, which is "truly half the herd."

The sow should be of a prolific family and in fact the same description as the male will fit her, except she should be lengthier and looser build than the male in order to enable her to carry a large litter.

We have tried in our humble way to give you our idea of "How and Where to Buy Breeding Animals," and hope we may have dropped some idea that may help you along, and if you happen to be a farmer and haven't thoroughbred hogs, let us insist that you get a nice thoroughbred male and use on your grade sows and notice the result.

If you get a nice boar and use him a couple of years and think at the end of that time you are not more than repaid, we will refund the money if you buy from us, and believe every other breeder in the United States would do the same thing.

STARTING A HERD OF THOROUGHbred SWINE.

BY JAS. RILEY, THORNTOWN, IND.

Ever and anon there is some one starting into the business of breeding thoroughbred swine. A mistake made in the beginning makes success so much more difficult to attain, so we should feel our way very carefully and not take too many risks or try to start out on too large a scale. There are some things in every business we undertake that can only be learned by experience, and it isn't advisable to take on too much experience at first, or failures will overtake us so rapidly that we will become disgusted in the venture and get out of it just as rapidly as we started in.

To one who contemplates embarking in the business of breeding and rearing thoroughbred swine, I would recommend that the market be very carefully looked into the first thing. See what kind of an animal, and where the surplus can be disposed of to the best advantage.

We need not expect to do much in the way of selling stock for breeding purposes at fancy prices until we have established a reputation, so we should figure on the regular stock market.

We should next decide what breed would suit us best, or what would come nearest filling the demand we intended to supply. To this end we should visit and carefully examine the herds of some of the most reliable breeders of the country, and carefully examine and note the different characteristics of these different breeds. There are several things we should take into consideration in determining what breed should be invested in. First, look into constitutional vigor or stamina of the breed that would enable them to resist disease. To determine this we should examine the chest, especially the chest bone between the fore legs. An animal should stand very wide between the fore legs and be full around the chest. The next important point is back and loin. A wide, strong back and loin with ribs well sprung indicates strong constitutional vigor. Next in importance are feet and legs. A strong bone in leg and foot is absolutely essential as indicating vigor. Get also a wide, deep ham. Then it is very important to have a good head, a short face with a wide, full forehead. A short neck indicates docility and great feeding quality. The next thing is prolificness. The sows should have large, full litters and be good sucklers. These traits are largely hereditary, and are very desirable, as it enables the breeder to keep a less number of brood sows to raise a given number of hogs, and if good sucklers they give their pigs a better start. Then the rustling quality of the hog should be considered. The hog that is the best grass hog, and can shift around and gather up part of his feed that would otherwise go to waste, is to be preferred to the hog that is more lazy in its habits.

One of the most important things in swine raising is quick growth. The hog that gets to 200 pounds at the youngest age and on the least feed is at this time the standard hog. Not the hog that matures the quickest, as the market does not demand the mature hog, but rather the pig pork. Some of the smaller breeds that mature so quickly will not reach the 200-pound mark nearly so quick as some of the large breeds. At the present time many of the largest breeds can be fattened at any age, and the pigs can be made to reach 200 or 300 pounds very quickly and make the very best quality of pig pork.

When the young breeder has found the breed that comes most nearly filling all these requirements he should make his selections very carefully. Never select a runt because you can get them cheap. Don't get the color craze, and reject an extra good pig because it has a black foot or a black tail, or if a Chester White, because it has a dark spot on the skin, but select the pig that comes most nearly filling the requirements given above, no matter if you have to pay a long price. It will soon come back with interest. You should then become a student of your business. You should love your pigs and stay with them.

If one expects to become an expert in the breeding line he should attend breeders' meetings and in every way try to become posted in every line of detail work. If you want to become an exhibitor you must visit the shows, carefully observe how animals are handled and note particularly how they are fed. Much of the business of successfully breeding swine must be learned by seeing how others do the work and leaving nothing undone that is necessary to bring the greatest success. Those seeking information can always get what they want by applying to any experienced breeder who will always be found as ready to impart the same as the novice is to receive.

RATION FOR THE PIGS.

When the pigs show a disposition to eat from the trough one to which the sow can not have access should be provided. Now is the critical period in the pig's life. If we over-feed we impair digestion. If we stint in feed we retard growth. If the feed is too constipating disease is ready to enter. If it is too laxative scours is produced. These ills may result from careless feeding of the sow.

No iron-clad rule can be given as to quality and quantity of food for the pigs at this time, as conditions vary and much depends upon what the sow is receiving. If she has an abundance of succulent food or pasture pure skim milk is excellent for the pigs; otherwise it is too constipating, unless some bran and oil meal are added.

IS THE SWINE BUSINESS LIABLE TO BE OVERDONE?

BY J. A. MEISSNER, REINBECK IOWA.

If our business is overdone we are on the road to ruin; if not we are on the road to prosperity. The way I understand the word "overdone," it may mean raising too much pork, or raising too many thoroughbreds of the present quality and excellence. I will try to touch on both these topics. Can anyone name any enterprising line of business, private or public, be it in the line of improved machinery, or of manufactured articles, where the greatest efficiency possible to attain has been reached? Perry's fleet, in 1812, was undoubtedly considered magnificent. Naval science had been exhausted in its construction, yet a single shot from one of our modern battleships would have sunk the combined fleet of Perry and Barclay, if they had been placed in a line. Three or four men with Gatling guns would have indefinitely defied the millions of Persians in forcing the pass of Thermopylae. The genius and science of man has not only been applied in one, but in every line. Mechanically speaking, the hog of fifty or seventy-five years ago was very crude; its engines were imperfect, wasting all but a small per cent. of its energy and fuel. Still, I have no doubt the razor-back of those days, though it required from two to three years to mature him, and he was almost as fleet as the swiftest horse, and could clear any rail fence constructed by man, was nevertheless pointed to with pride by his owner, who might justly be proud, for they were the best the times afforded. The hog of to-day in form has almost reached the standard of perfection. Its machinery for converting corn into pork is of the latest design; the science of breeding knows none better. Can we raise more pork than the world is able to consume? I do not think we ever can. While our hogs were the lowest in price, there were plenty of our own people, and many more in foreign countries, who did not taste pork once a week. Increase your facilities for transportation and get the foreigner to lower his tariff, then you will not only extend and widen our market, but you will feed the millions of Europe, Asia and Africa who practically get along without the hog product. I do not think we ever could raise more than the demand would consume, but, supposing we could, which class of hogs would suffer first? Those with the best or those with the poorest machinery? Be it governments, corporations, merchants, farmers or hog raisers, it is always a question of the survival of the fittest. Those equipped with the best machinery will drive the poorer from the field.

To say that the hog of to-day is no better than the hog of half a century ago is a slur on the ability of hog breeders. It would mean that their

work of the last fifty years was a waste of energy. Hogs have been cheap; so has corn. Corn is the principal factor in the product called lard. Increase the price of corn and an increase in the price of lard will follow. Corn will be 50 cents a bushel again, and it may not be long. As soon as corn goes up, lard will follow, reaching its old-time price. It is possible the product from cotton seed will permanently depress the price of lard to some extent, but it will never drive it from the market. When we feed less corn to our improved breeds of swine we will produce more lean meat. The well-bred hog will not only make more pounds of pork from a bushel of corn, but will also produce more from an acre of blue grass and clover. To stop and consider for one moment the advisability of going back to the rail-splitter type is absurd. We have passed the age of razor-backs and Tamworths. They are back numbers. We are in the era of improved breeds.

The improvement in hog breeding has been scientific and is permanent; it will progress, not retrograde. The cheapness of hogs the last few years has led some of our intelligent type of "I-told-you-so" citizens to cry: "You breeders are breeding too fine; you produce too much lard and not enough bacon. You will have to go back seventy-five years and try it over. Your improved breeds are out of date. We have just what you want; we possess the bacon hog in the rail-splitter and his consorts." Ah, my friend, we are living in an age of advancement; we take no backward steps. If you want more bacon, we have the ideal bacon hog in our Poland-Chinas, Berkshires and other improved breeds. If they produce too much lard, we will feed less corn, more grass, and produce all the bacon you want of a much nicer and sweeter quality than your hog of ancient design ever dreamed of.

GENERAL PRINCIPLES OBSERVED IN FEEDING.

BY W. A. HART, PORTLAND, IND.

The nutrients of the feed to which we need give especial attention, are protein, an element of nitrogenous formation, carbohydrates, elements of sugar or starch formation, and fat. The only proper sense in which to study the domestic animal is as a machine calculated for some special purpose, and the feed consumed by such animal as crude material to be manufactured by such machine into meat, milk or wool. If it were true that when you feed the animal a given amount of protein in every case a given amount of lean meat would be produced, or if a certain amount of fat or carbohydrates were fed, a given quantity of fat would result, but little study would be required to make successful feeders of us all. Feed-

ing is as much a business proposition as the management of a factory or railroad, and the success or profit that may be obtained from feeding is as much dependent upon intelligent care and housing, upon intelligent feeding and upon intelligent and economical production of feeds as is the success of any other business undertaking upon the intelligence of its management.

Experimenting with the feeding of protein, we find that so long as the amount of protein fed remains below the requirements of the animal fed for any increase of protein there is a corresponding increase of protein stored up in the body, but as soon as that limit is reached not only is there no increase in the amount stored, but an actual decrease in the amount stored. The same is also true of carbohydrates and fat. However, when all are fed together, rightly proportioned, a greater per cent. of each is stored by the animal. Whether money is made or lost in feeding depends entirely upon the relative cost of producing the feed, to the amount of meat, milk or wool produced from the feed.

HOW TO PRODUCE MOST FROM FEED CONSUMED.

Methods for producing the most from the feed consumed will first be discussed. To illustrate: The market demands a hog weighing 200 to 250 pounds, a beef weighing 1,200 to 1,300 pounds, or a 75-pound lamb. Our first impulse would be to select a small or medium type of animal, but experiments show that a very young animal may produce a pound of meat to each pound of dry matter in the food consumed, and that as the animal approaches maturity more and more feed is required for each additional pound of gain, until, in the case of the four-year-old steer, it takes twelve or fourteen times as much feed to make a pound of gain as when the same steer was a calf. At maturity gain entirely ceases. Experiments further show that the rough animal, whether large or small, often requires twice as much feed to make the same gain made by the finished type of the same age and size, and that in the market, for the reason that at slaughter the rough type shows greater waste and a smaller per cent. of choicest cuts to the weight of dressed carcass, the coarser type commands a much less price per pound. Under the most favorable circumstances it requires eighteen pounds of dry matter in the feed per 1,000 pounds live weight each day for the steer; about two pounds per 100 pounds live weight of feed as good as middlings each day for the hog, and practically in the same proportion to the other farm animals to maintain them with neither gain nor loss. It is only on the excess fed above this amount from which any profit may be derived.

The successful feeder must mature his animal as rapidly as possible from birth to market, and sell his heaves at yearlings, weighing 1,200 pounds; his pigs at six or eight months of age, weighing 200 to 250 pounds, and his lambs at from three to five months of age, weighing from sixty

to ninety pounds. From the foregoing one can better comprehend why he selects 2,500 to 3,000 pounds finished cattle to raise the 1,200 to 1,300-pound baby beef, or the 800 or 900-pound hog to raise the 200 to 250-pound pig. Bear in mind, however, that it is only under the most favorable surroundings that the maintenance ration falls as low as the amount stated. Where animals are not properly housed, regularly fed, sufficiently supplied with water, or otherwise receive improper attention, the maintenance ration has to be double or triple the amount stated.

The successful feeder knows also that the dairy cow, properly sheltered, pays an extra profit of about ten cents per day for shelter; that the pig requires about one-fourth less feed for the same growth than the pig not sheltered and that the same proportion of gain from shelter is shown by the other domestic animals. That soaked corn to pigs is worth about one-fourth more than corn not soaked; that soaked corn to cattle makes a gain of one-fifth more than corn not soaked, but that with pigs following the cattle the saving is only about five bushels to each 100 bushels so fed. That the mixture in winter of cut clover hay with corn meal for pig feeding effects a saving of 30 per cent. of grain to amount of gain, and materially benefits the health of the pig. That the feeding value of wheat, pound for pound, is no greater than of corn. That cooked feed, except potatoes, not only makes less gain for feed consumed, but impairs the health of the animals. That salt fed daily greatly increases the gain from the feed consumed. That the feeding of about two ounces of wood ashes or a couple of spoonfuls of bone meal each day to a hog on full ration of corn will make the same growth with a fourth less corn. That ground corn only shows a saving of 8 per cent. when fed to pigs, which scarcely pays for grinding. That ground feed fed wet to pigs shows a gain of 7 per cent. more than the same feed fed dry. That feed fed to the dam while suckling her young gives as much growth on the young as though fed direct to the young animals, hence the false economy of not maintaining the dam on full feed as soon as practicable after the birth of the offspring. That the self-feeder for lambs requires one-fifth more grain for a given amount of gain than when fed in the regular manner. That lambs shorn and dipped in hot water will make a rapid gain under conditions in which the unshorn lamb will show a loss.

That corn not mixed with other grain is the cheapest ration that can be fed to the lamb that is intended for the market, and will, pound for pound, make as much gain either before or after weaning as the same number of pounds of a mixture of oil meal, oats, middlings or of the costlier feeds. That corn cut when fully ripe contains very much more nutrients than when cut when only glazed as is the custom.

That two-fifths of the feeding value of the corn crop is in the fodder and three-fifths in the ear. That the grasses carry the most nutrients when fully matured, and lose from 12½ to 40 per cent. of nutrients from getting wet in curing. The successful feeder not only knows these facts,

but profits by his knowledge of them. He is constantly on the alert to take any advantage he may of the market or of the method of feeding to realize the largest profit from the feed consumed. In short, the most successful feeder, as I take it, is the man who is able to realize the largest profit from the feed used, rather than he who makes a more rapid gain at a loss. It is especially important that those engaged either in feeding or breeding hogs on a large scale should fully realize that the margin of profit in every kind of business of to-day has been reduced to a system by which one can only derive a profit by the most economical method of feeding, and there is a very large per cent. of the feed necessarily produced in producing feed for the hog that must be fed to other farm animals to realize a profit from its production. Most of us, in some degree, realize the advantage of having a properly balanced ration for the farm animal and of having a succulent feed for him as nearly as possible during the entire year. It is on this line, especially, that I regard the result of my experiments of especial value to the general public.

Of the hundreds of breeders of shorthorns of their day, the names of those, other than Mr. Bates and Mr. Cruikshank, have nearly all been forgotten. Of the thousands of breeders of live stock to-day, the names of those as deserving in their line as were Mr. Bates and Mr. Cruikshank in theirs, will, in future ages for the same reasons, be held in that same high esteem. Few fully realize the advantage of selecting for the feed lot animals from the large, finished, properly developed parentage, rather than from the little, gouty, dyspeptic, misshapen kind. It is discreditable to be a breeder of blooded stock without earnest effort to produce the best, and equally the height of folly to attempt to produce the best without resorting to the kinds of feed and care by which this result can only be attained.

SUCCULENT WINTER FEEDS.

In the cold climate of the northern States, one can not rely upon pasture to furnish the necessary amount of succulent feed for the domestic animals during the long winter and spring. While the silo may supply this need for some of the domestic animals, the only crop that my experiments have shown perfectly adapted to this purpose, for the hog, is the beet crop. For this crop one must select rich soil, containing plenty of humus, that is well drained with deep tile drain. Plow very deep, as early as possible in the spring, harrow the ground every few days until the latter part of May or first of June. This should make a perfect seed bed, free from weeds. About this date, the temperature will be such that seed will come up very soon after planting. Drill the seed very thick in the row, with some good standard make of garden seed drill that presses the fine dirt to the seed, as the beet seed otherwise germinates slowly. Let the rows be about twenty-eight inches apart, that the beets may be cultivated with the ordinary small shoveled two-horse cultivator. When

the beets are about five or six inches high, thin to a beet every six inches in the row. Late planting, care in selecting, the variety grown and growing the beets thick in the row, prevents them from being so large and woody. Some variety of sugar beet or the improved, long, red mangels are preferable. The mangels produce a much larger crop and are much easier harvested but are not quite so rich in nutrients. Late in the fall harvest the crop and store it either in long pits or in a root cellar for use during the winter and spring. If stored in a long pit, every five or six feet along the top of the ridge of beets place a small bunch of straw. Set a tile upon end on each pile of straw, so placed to give the pile of beets ventilation to prevent heating. Cover the beets with dirt, using no straw next to the beets except as mentioned above. From twenty to fifty tons of beets can readily be produced to each acre so cultivated at a cost of from fifty cents to one dollar per ton, harvested. The beets are simply thrown whole, without cooking, to the hog and are eaten with great relish.

TANKAGE AS A SUBSTITUTE FOR MILK.

Especially with young pigs one finds some feed of great advantage that is rich in all the nutrients required, that is easily digested and especially palatable. Slops from the best hotels and restaurants may be valuable, but are usually not accessible to but few and require too much time and labor to gather and feed fresh. Whole milk, fresh, is too valuable for this purpose. Skimmed milk or butter milk can seldom be had by the feeder without too much expense or loss of time and labor in getting them from the creamery. The same objection may be urged against meat scraps from the butcher shops or fish markets. Besides, one is almost certain to occasionally get a bad batch of these feeds that will greatly derange the digestion of the animal.

A year's experience with feeding tankage shows it to be an ideal feed for this purpose. Blood, lungs, etc., are cooked together in large tanks at the large packing houses. The fat is drawn off and the residue dried and ground for hog feed. It costs about \$23 per ton, laid down at home, and contains about double the protein found in oil meal, and is a very much better feed for pigs. It seems to be a perfect substitute for milk. A pound of the tankage, costing less than a cent and a quarter, having a feeding value equivalent to about three gallons of skimmed milk, for pigs. A mixture of thirty pounds of corn to ten pounds each of wheat middlings and tankage makes a very well balanced ration for pigs up to four months of age. A very good ration for older pigs or hogs may be made by reducing the middlings and tankage fully half in proportion to amount of corn. Tankage dissolves almost instantly when put in water. It should be fed in slop. Pigs fed upon tankage show great muscular and bone developments, have ravenous appetites, and are especially free from gout and rheumatic troubles. It apparently outclasses milk in these par-

ticulars. Tankage is so dry that there is no danger from worms or from decomposition, and has been so thoroughly cooked that one takes no risk of contracting disease in his herd from feeding it.

OLD METHODS CONTRASTED WITH NEW METHODS OF FEEDING.

It is of especial interest to note the evolution of our method of feeding. The tendency of our time is to eliminate the smaller man. Some look longingly to the past, others confidently to the present and future with perfect faith that in every case a more useful man will spring up in his stead. One capable of giving more of peace and more of plenty to himself and to mankind generally. But a few centuries ago the best stock raisers of their day depended wholly upon pasture, without shelter for their stock, not only in summer but throughout the entire year. If the season was such that their stock could find sufficient feed to sustain life, all was well; if they died from starvation, it was simply "an act of God." This class of feeders have been crowded out, and in their stead we have those who prepare not only an abundance of feed, but also the best of shelter for their flocks and herds throughout the entire winter. To the feeder of little more than a generation ago this would have seemed the end of perfection in feeding; to-day we clamor for something yet better than we have. The feeder of to-day has better pasture grasses than were enjoyed in any preceding generation, yet he notes that even with these, there are seasons of ripening and of drought in which they fail to furnish the best of feed for his stock. While soiling crops, in a degree, may tide him over at these times, yet so much labor is required to cut and feed them, that the margin of profit is materially reduced, beside most soiling crops are not sufficiently succulent to be the most satisfactory feed, especially for pigs and lambs. The need of to-day is a plant that can be grown on almost any kind of soil, that produces a rank growth of succulent feed, especially in dry weather, that can be planted at any time of the year, that can be planted on any tract of land, for the time, not occupied by other crops, and thus be made to not only shade and conserve the fertility of the soil, but also to furnish a thick growth of succulent pasture greatly relished by all farm animals.

DWARF ESSEX RAPE AS A FORAGE CROP.

Largely through the efforts of our worthy secretary of agriculture the attention of feeders has been called to such a plant. It is the Dwarf Essex Rape plant. Only four or five years ago but a few acres of rape were grown in the United States; to-day we grow millions of acres, yet many farmers do not know what it is, and of those who do raise it but few conceive its many possibilities. Its possibilities are due to its rapid growth, to its palatability, to the fact that it will grow well on land with almost any manner of preparation and for the reason that it matures a

great quantity of feed planted long after the season has passed for planting any other feed crop. It resembles cabbage, except that it fails to head. The seed resembles the cabbage seed. This crop grows especially well in dry weather on our heavy, cold soils, that will not mature corn. The land for early spring pasture should be plowed as early as possible and harrowed until a fine compact seed bed is made. Sow from three to five pounds of the seed to the acre with some kind of broadcast grass-seed sower, and cover with a light drag, or by dragging brush over the land. Five pounds of seed per acre should be used where weeds are liable to spring up. Rape sown in early spring will be ready for pasture when from eight to twelve inches high, which should be in about six to eight weeks after sowing. It will produce luxuriant pasture, sown at any time from early spring until late in August, in this climate. Rape sown in hot weather may be ready for pasture within a month after sowing. Rape sown in the corn in advance of the cultivator at the time of laying the corn by may produce from ten to twenty dollars worth of feed per acre for lambs without interfering in the least with the corn crop.

Lambs may be pastured in the corn long before it is ripe without injury to the corn. It has an equal value sown as a catch crop in oats or wheat stubble after the crop has been harvested. The stubble land should be sufficiently prepared with a disc harrow, to make a good seed bed. Rape furnishes succulent pasture, relished by all domestic animals from May until steady cold weather sets in for the winter.

When our pasture grasses are dry and parched, and fail to collect moisture from the atmosphere, heavy dew is found on the rape plant. It is of the cabbage family and is as easily gotten out of the soil as is the cabbage. This crop will readily make five hundred pounds or more of meat per acre. An acre of rape furnishes fully as much pasture as four or five acres of our pasture grasses, and is much more relished by the stock. Experiments show that stock will put on 50 per cent. more gain in a given time pastured on rape than on the best of our pasture grasses, but when allowed to feed upon rape and grasses, they show a better gain than when feeding upon rape alone. Rape occasionally bloats some of the domestic animals, but hogs do not bloat from feeding upon it.

The requirements of to-day are beautiful symmetry and early maturity. We often find farmers, and even breeders, who mate a very fine, small-boned animal with one of exactly opposite characteristics, expecting to produce a medium hog of uniform appearance. Disappointment awaits them. The more diverse the ancestry, the more diverse will be the offspring. The only way to secure increased size, without the sacrifice of neatness, is by constant graduation.

MANUFACTURING HOGS.

BY WILLIAM JACK, MARTINSBURGH, IND.

Indiana is supposed to have about three million head of hogs on foot. In raising and marketing them four things are necessary to make the work profitable: First, the right kind of stock; second, being prepared to take care of them; third, knowing how, and fourth, doing it. The latter is the one that is most commonly lacking. The average hog raiser guesses at the best way, and then guesses whether or not it pays him.

What I shall give will be as I have found it by actually weighing hogs and feed so far as it was possible, and making estimate of what else that could be reached in no other more exact way. The same kind of experiment with different kinds of hogs may make the difference between profit and loss. The profitable hog is the quick maturing one, and the right way is to push from start to finish and put on the market at once. The profitable size to make them varies with the different breeds. With the Polands it is reached at about 170 pounds, and in age from six to eight months. Our experience shows that a pig from the time it is weaned until it reaches about 170 pounds will make a gain of twenty-six to thirty-one pounds of flesh to the 100 pounds of grain feed eaten. After that weight is reached it takes more feed to make a pound of pork. Three hundred and fifty pounds of shipstuff and six bushels of corn will make one pig weigh 170 pounds, including the feed that dam eats in a year. One sow with two litters a year, say fifteen pigs, which is a fair average, will eat 4.250 pounds of shipstuff, at say \$14 per ton, \$29.75; ninety bushels of corn at thirty-three cents per bushel, \$29.70; a total of about \$60.

The pigs weighing 170, equal 2,550, at \$4.00 per hundred, would sell for \$102. Taking out \$60 it leaves \$42. If the droppings are not wasted, they are worth about \$30 for fertilizer.

Fourteen shoats, weighing 1,426 pounds, an average of 102 pounds each, were put in a fairly warm house on a floor January 1. Previously they had range and were fed shipstuff and corn. On January 16 they weighed 1,737 pounds, eating nineteen bushels of corn in sixteen days, and making a gain of 311 pounds. This was sixteen pounds of gain to one bushel of corn. February 9 they weighed 2,110 pounds, eating thirty-four bushels of corn in twenty-four days, gaining 373 pounds. This was eleven pounds to one bushel of corn. March 10 they weighed 2,370 pounds, eating 29 bushels in twenty-seven days, gaining 260 pounds. This was nine pounds of gain to one bushel of corn. They were then put on the market, this being sixty-nine days in confinement. The hogs showed signs of weakness in legs two or three weeks before the end. They were provided with plenty of water, a good bed and fed nothing but corn. In December,

1897, I weighed sixty-one shoats that averaged sixty-seven pounds; they were fed shipstuff and soaked shelled corn. In nineteen days they had eaten forty-one pounds of shipstuff and 36 pounds of corn each, and gained twenty-six pounds. In thirty-seven days they ate on an average three bushels of corn and 110 pounds of shipstuff, and gained sixty-nine pounds. This brought them to 162 pounds and they were marketed. They had the range of a field and large woods, with house to sleep in. They showed no signs of weakness. We breed our sows in May and June for fall litters; December and January for spring litters. This brings the pigs in September, October, March and April. Young sows are bred so that they will farrow about the time they are one year old. We try to have the sows in good healthy condition by feeding shipstuff and running on some kind of pasture, clover preferred. A few days before the arrival of the pigs we put the sow to herself with a comfortable bed, not too much straw. After farrowing, give only water to drink for twenty-four hours, no feed at all. Then feed sparingly of bran or shipstuff for three weeks when the sow may be eating a full feed. Provide a shallow trough out of the reach of the dam where the pigs may eat shorts wet with milk or water. A little corn may be fed the sows at the end of four weeks. The pigs may have corn by this time, or corn meal which is better. The pigs should follow the sow on nice days. They need exercise and sunshine.

Make sure they are free of lice. See to the sow before the pigs come; keep the bed dry, but not dusty. Give the sow plenty of range. The first three weeks is the critical time with the pigs; they are likely to become fat and take the thumps. Exercise is the best medicine. Regular and moderate feeding will help to keep down the scours, which is usually caused by letting the pigs or dam get real hungry and then overfeeding or allowing the bed to get damp. A teaspoon of copperas dissolved in the dam's feed is a good remedy. Wean at seven to ten weeks of age by taking the sow away from the pigs; never pen them when they can be managed without. Feed three times a day for a while, as the pigs get older they can eat coarser feed, but continue the mill feed of some kind till nearly ready for the market, increasing the corn in proportion to the mill feed as the end approaches. The idea of turning pigs on grass to grow without feeding grain feed is all wrong, but pigs will do best when they have pasture to run on. Clover hay, or better still, the leaves that shatter off is good to feed in the winter. They will pick it in the fashion of a sheep, or it may be mixed with ground feed. Ashes with one-fourth salt mixed and kept dry in their reach is almost indispensable. Charcoal and lime will also be eaten. Small lots running together will do best, especially if they are of different sizes. Hogs properly fed will not root. When you see them rooting it is a good warning that your part is neglected. Don't feed too long. The profit is in small hogs. Better sell 500 pounds in three hogs at a profit than the same amount in two at a loss. Going back to the brood sow, after she is away from the pigs put her in

shape and breed again. Two litters a year is more profitable when we consider the cost of keeping the sow six months in idleness. In selecting a brood sow select one large in chest, fairly long in body, with good action and quiet disposition, one that is from a profitable family and a good suckler. When one has proven good qualities don't discard her on account of age; the strongest pigs come from fully matured parents, and if properly treated they will not get roguish with age nor too fat for breeding. The herd boar may be more bulky, but with a tendency to take on flesh.

In selecting stock see that they are up near the standard, especially in size, and don't breed an animal simply because it is pedigreed stock. Select one that has individual merit. Hog houses need not be expensive, but sufficient to keep dry and warm. The feed is the costly part of hog raising, and the more comfortable the house is and the better trough and feeding places that are provided the greater our success will be. A good trough is made in the ordinary V-shape pattern. Nail strips across or lengthwise of trough to keep pigs out of same. Different size pigs need different size troughs.

WHY DO HOGS GET SICK?

BY E. H. COLLINS, CARMEL, IND.

I visited a large dairy at Greenwood recently and in walking into the stables could hardly make myself feel that it was used every day to milk in. It was thoroughly cleaned and coated with slacked lime. It appeared more like a sprinkle of snow had fallen on a clean place.

I said to myself that if we could only give our hogs and poultry the same care we should have no cholera.

We have some farmers who think that nothing is known about hog cholera germs. Of late years even a famous breeder claimed that a hog dead of cholera is worth fifty dollars to bury and take up after a while to feed to the herd. He claimed that the burial gave the poison an attenuated vitality which acted like vaccination. The strangest part of it was that an intelligent man (not, however, a scholar) should insist on such a statement when he had the best authorities in voluminous records against the practice. The result of this foolish fad was that after a few years the cholera came along and nearly all his fine herd died. This wasn't so bad, if he had been the only one who suffered.

In spite of numerous similar examples of misdirected enthusiasm, we have yet with us lots of "sure cure" doctors and they give numerous references of deceived or dishonest patrons.

One of these "sure cures" is quite popular now with many and the advertiser claims that if you will buy a "farm right" to use the remedy for ten dollars, he will give you a receipt that will render the pigs unborn immune. This is contrary to all scientific teaching on contagious diseases. The mother does not bear a child that is immune, and in extensive experiments it is known that an attack of cholera, with swine, causes immunity only for a few years at best with the animal itself, and that it does not have the power to give immunity to the pigs. With this as with a number of humbug remedies there are many isolated cases where there was apparent relief, and everything that will bear it is accredited to the excellence of the remedy. If cholera in the human family passes through a community it does not kill all. Probably four-fifths will escape. They have natural immune. So with hog cholera and especially is this true of certain less fatal attacks.

The quack and the untrained empiricist notice these times of apparent immunity or less fatality, and credit it to some fancied remedy, often one that has long had a sort of superstitious jugglery associated with it, and they actually mislead some that have influence.

Yet we hear them derisively answer, "Have you ever tried it?" If many people would try it at ten dollars a farm it would make a man some money before the bottom fell out, which is sure to happen. Suppose you ask me to try growing an onion from an acorn, it is surely not necessary to try it. So all science has taught just as clearly that hogs dead of cholera are a deadly poison to well ones and also that the mother can not give immunity to unborn offspring. We don't have to try it. Those questions have been worked out for us just as certainly as have problems of astronomy that tell the coming eclipse to the second.

I write at some length on this to call a halt in expensive testing every new fad that is jumped up.

If any one wants to experiment, let him do so, and then let us wait till he allows his "sure cure" to be examined by those who know something about it.

If there is anything in it, an examination will help him. And if he proves that he has a valuable remedy he can get any price he can hold his breath long enough to name.

One thing is sure, that hog cholera and swine plague are both caused by bacteria. And that no animal can have these diseases without it arising from those causes. It is not so sure that the hog cholera microbe is not identical with the typhoid fever germ in man.

We have the enemy discovered and surrounded, but he is intrenched, so that we can not kill him. Perhaps the best that can be done at present is to protect as much as possible from his raids, from his hiding place in the soil or upon some animal in our herds.

The microbe of these two swine diseases is carried about on the litter

and dust, by wind and animals, till it is common to find some of the germs in the systems of almost every individual where the disease prevails.

It is well known that a 5 per cent solution of lime or carbolic acid will kill these germs. Formalin is also a deadly enemy.

If we can't keep our herds in a close barn, we can do many things that are equally helpful as far as they go. We can separate all ailing hogs. We can burn all dead ones. We can feed a fairly well balanced ration. It is also very helpful to allow hogs access to plenty of ashes and charcoal. Theodore Louis burns cobs by digging a hole in the ground five feet across at the top and tapering to one foot at the depth of five feet. You start a fire in the bottom and slowly fill with cobs till the whole mass is getting hot. Then cover with a tight cover and leave a day or two and it will be a mass of charcoal. He then recommends the following mixture: Take six bushels of this cob-charcoal, or three bushels of common charcoal, eight pounds of salt, two quarts of air-slaked lime, one bushel of wood ashes. Break the charcoal with a shovel and thoroughly mix. Then take one and one-fourth pounds of copperas and dissolve in hot water and sprinkle over the entire mass and mix carefully. Place this mixture in a self-feeder.

Many readers are familiar with Professor Henry's experiments in feeding ashes to hogs. Here is one table of great interest:

	When Bone Meal Was Fed.	When Ashes Were Fed.	When Neither Was Fed.
Cornmeal required to produce 100 pounds of gain, in pounds	487	491	629
Average breaking strength of thigh bones, pounds	680	581	301
Average ash in thigh bone, grams	166	150	107

By the table we learn that feeding bone meal or hard wood ashes to pigs otherwise confined to a corn-meal diet effected a saving in feed of 23 per cent. And we also learn that the strength of the thigh bone was just about double that of pigs not allowed bone meal or ashes. It was also found that when the bones were burned, those of the pigs fed ashes contained 50 per cent. more lime ash than the others.

It is evident that it will not do to confine any kind of stock and feed on corn alone for a great length of time.

Some good farmers are feeding on piles of wood ashes. After a few rains they will eat on ashes well. Thus they get a little lime in the mouth which will likely kill any microbes of disease that are entering the system. The stomach content being acid will prevent the lime from having much destroying effect in the intestine. It may, however, furnish lime for the bony framework of the animal.

We can give our pigs comfortable quarters and clean beds. Some recommend in case of sows in little houses to themselves, we should move the house often. We can also clean the troughs and purify them with lime. The trough may be moved about and sometimes an old one burned. I despise an old sour trough and treat it as I treat an old slop bucket—burn it. I do not think men are careful enough to change about often when feeding on the ground. They feed in one place till it is sour and stinking.

Wallows are dangerous things. A hog does not need one if he have shade. But since swine do not sweat they must have shade or mud. The wallow may be made safe by pouring a gill of carbolic acid on top every day. This is also good to kill lice as the oil will float and cover the animal as he lies in it.

All causes that enfeeble the vitality, pave the way for disease. Breeding gilts too young; inbreeding; stunting; starvation of parents or pigs; a corn diet, or a sudden change from short pasture or from a hungry trip on the cars to flush feeding. Also exposure to severe weather or sleeping piled up in wet straw from which they come out smoking. All these artificial, unsanitary conditions tend to prostrate the vitality and open the door for disease.

Some of the most inexpensive feeds with which to give the hog a natural diet are clover pasture in summer, and a chance to follow cattle in winter. For pigs especially, many use roots in winter or bran. Artichokes and boiled potatoes are very much enjoyed. Silage is sometimes fed. Perhaps the cheapest boughten food to balance corn at present is tankage. This is a nitrogenous waste at the great slaughter houses, and sells at about \$23 a ton, with freight extra.

SWINE A SPECIALTY.

BY H. L. NOWLIN, GUILFORD, IND.

It is not necessary that a man making a business of the swine industry shall be a breeder of swine for breeding purposes. He may breed for the feed lot and be a specialist, and what is said in this article is intended to be as applicable to one as the other.

The most important fact in determining the success of this enterprise is the adaptability of the manager to the business. His qualifications must be such that he is able to select the most suitable location and arrange pastures and lots so that the work in caring for the stock will be reduced to the minimum. He must be able to select the breed that will yield him the most profit, and the most profitable individuals of this breed.

This means that the business must be studied from various standpoints. It means that the manager must spend much time among his swine; that he must know each individual animal and its needs, that he must know just what form of animal will produce the most pounds of meat with the least feed, or, in other words, he must be a good judge of a perfect hog. If he has these qualifications he will likely be a successful feeder or breeder, but if he stops here his labor is in vain because he must know where to find the best market and how to successfully reach that market. It is also necessary to know just what style animal will bring the best price according to time, and feed necessary to fit the animal.

At present no other person can make as much of a success feeding hogs for market as the man who makes his hogs weigh 200 pounds in the shortest time with the least feed, and the short time with proper care are two very essential points, because it must be remembered that it takes a certain part of the feed given an animal to sustain what is already there, and the gain in weight is made by what is fed in excess of what is required for maintenance. This is a fact too often overlooked. Just try an experiment on two pigs by feeding one enough to keep him at his present weight, and give another one all he will eat, and you will be surprised what a small difference it takes in feed to make a profit or a loss.

The location of the farm must be such that it is at least reasonably easy of access to market and must lie so that it is either naturally well drained or easily artificially drained, and should never lie close to a small stream coming through other men's farms. Swine should never be allowed to drink surface water. This may seem to be putting it a little strong, and it is something that can not be absolutely controlled, but it is necessary to do the best possible to avoid it. If hogs are allowed to wallow in the water and mud, their wallows very soon become disease breeders, and if hogs have access to a stream coming through another man's farm and his hogs get diseased your hogs are almost bound to. Shade is necessary, but wallows are not, and the best shade is not made by trees, but by setting posts in the ground and covering over with a little straw or old hay. Do not put on too much covering or it will hold water too long after a rain, but put on just sufficient to make shade (about six or eight inches deep). These shades should be at least twenty feet square and five feet high and no sides of any description, so that the air can circulate freely.

If a permanent feeding place is desired it can be a house with a number of pens in it in which to feed, and lanes leading from these to small lots in which the hogs run, and where there should be other houses for sleeping quarters, as sleeping and eating quarters should not be in the same building. If it is convenient to change locations it is certainly desirable, and while it is not so convenient a way to feed, it is, in many respects, preferable to a permanent place. When the latter plan is used

portable houses can be used, and there are various styles of these, many of which are good and easily moved from place to place. While portable houses are necessarily small, they are large enough, because not so many hogs can be kept in one lot, and they always do better with a few in a lot than with a great number (ten should be the limit).

All pens and feeding places must be kept clean and neat as possible. Swine are not dirty animals if given an opportunity to keep clean. Sleeping and eating quarters must be disinfected at least once a week for best results, and while disinfecting pens, etc., use some disinfectant that will kill lice and not injure the hogs, and sprinkle them good. It is wonderful how many millions of lice are fed to maturity every year.

Every man must make his own selection of breed. He will make the best success with his favorite breed, although some other may have advantages over it. Whatever breed it is, let it be a pure breed. There are no cross-bred swine that are as good, or at least any better, than one of the pure breeds used in making the cross, and invariably if these cross-bred animals are used for breeders, each generation will be inferior to its predecessor unless crossed with a full-blood, and if continually crossed with a full-blood you are continually coming nearer the type of the full-blood. Then, why not keep the full-blood from the start? Or, if it is necessary to keep the animals with only one cross to get the results desired, then it will be necessary to buy all the breeding animals used, which makes it much more expensive than raising full-bloods and buying only males. Then, the best plan, certainly, is to select the breed best suited to your location and ideas of a perfect hog and the one on which you can put the maximum number of pounds with the minimum feed, and stay with the same breed all the time. This answers for breeders as well as feeders, because the aim that should always be kept in view is to fill the pork barrel as cheaply as possible.

For swine to do their best it is necessary that they have a variety of feed. Milk is undoubtedly the best food for hogs of all ages, but it is not usually possible to get a sufficient supply of this. Middlings make a fairly good substitute but are frequently too high to be fed with profit. Soy beans, cow peas, etc., will surely answer the purpose, and from experiments these can be successfully raised at small cost. Artichokes and mangel wurtzels furnish good and cheap green feed for winter, and clover can not be improved for summer pasture. Pasture in summer and green feed of some variety in winter are absolutely necessary for the best success, and a variety is desirable at all seasons.

Swine should have access to water for drinking purposes at all times. Drinking fountains are all right if kept clean and sweet, but if a good spring is accessible it is preferable if properly prepared. To do this requires that the spring be so enclosed that the hogs do not have access to it, and the water should be piped to a trough so arranged that they can

drink out of it but can not get into it. From this trough there must be a waste pipe leading to a tile drain or sink, so no mud hole will be made at the watering place.

Many of the items mentioned may seem of little or no importance and it may seem that there are lots of details, but the man who makes a success with swine must look after the little things if he succeeds.

THE HOG AND ITS MANAGEMENT.

BY MONROE CRUMBINE, SOMERSET, IND.

The hog is a native of the eastern continent and has been known from early times. The domestic hog is believed by naturalists to be derived from the wild boar, although what nation first domesticated it is not known .

The wild hog was nearly omnivorous in its appetite and was ferocious when attacked. The ancients surely were acquainted with its uses. We learn from sacred history that the flesh of the swine was forbidden as food by the Levitical law. This prohibition was probably due to some dietetical reason, also the animal not being a cloven footed ruminant. There were no wild hogs found on the western continent at the time of its discovery. Hogs were brought from all other countries sending emigrants to the New World, so that it was not long until hogs became so numerous that they bred in the woods and became wild. The greatest variety came from England. Each district or county in England succeeded in producing a distinct variety. This was brought about by crossing with breeds from other nations, especially China, and each variety took its name from the section of country reared in. Likewise intelligent Americans have in recent times succeeded in producing some distinct breeds that possess superior qualities.

The chief characteristics of the old English stock were coarse, rough hair, long legs and body, narrow back, flat sides, long nose and large, thick ears.

The farmer should choose the breed that possesses large bone and frame, straight and broad back, round sides, short head, heavy jowls, smooth, straight hair, square hams, and rather small, thin ears. The best results are obtained by breeding from unrelated stock. It is better to cross the breeds rather than to breed in and in. Do not sacrifice size in any instance to get fineness, because such stock are too slow to grow, and therefore will not be so profitable.

Another point I wish to speak of regarding breeding is the selection of

stock as to sex. I presume that most farmers have only grades on their farms. And they are not objectionable if they possess good qualities. Grades are more preferable for dams than for sires, for the grade sows usually have larger litters than fine stock, and pigs generally take after the sire in form and structure and the dam determines the other qualities. You will discover this natural law by carefully observing the progeny of animals. By having a good sire better feeders will be the result, and it is the quickest way of improving stock. Select the best females out of the herd for dams, thereby saving the expense of paying fancy prices for them.

The swine, like all other domestic animals, are subject to disease, and the disease of the swine can, in a great measure, be prevented, mitigated and eliminated, as well as the diseases of other kinds of flesh. While caring for hogs, the old maxim, "An ounce of prevention is worth a pound of cure," should be heeded, especially in those districts where there is a tendency to some inflammatory disease. Our favorite remedy is the infusion of peach leaves. If the leaves are not procurable use the twigs or the bark of the roots; they possess the same medical properties and will have the same effect. Our plan is to dry some leaves in the fall so that we may have them for winter use in case of necessity. We have found the peach leaf tea beneficial in loss of appetite, vomiting, torpidity of the liver, inactivity of the kidneys, diarrhea, costiveness, etc.

Diarrhea is sometimes caused by biliousness or the presence of too much bile; this is known by the excrement being thin and of a greenish, yellow color. The same remedy is indicated. It will remove the unnatural tendency of the liver, so that it can perform its functions. When there is indigestion and loss of appetite, accompanied with vomiting, the stomach has become foul. This is usually caused by the absence of bile in the alimentary canal, the food not being moist enough to pass away from the stomach as nature demands. The above mentioned remedy will correct all the derangements of this kind. When diarrhea is not dependent on the biliary secretions, then nature demands an astringent tonic. A decoction of strong tea of blackberry roots, or the inner bark of white oak, or the two combined is indicated. The dose is one-half teacupful of the tea in slop at each meal for a grown hog. When suckling pigs are not thriving well and they require a restorative they must receive the remedial agent through their dam. A good condition powder is made as follows:

Blood-root	1 oz.
Sassafras	3 oz.
Licorice root	3 oz.
Gentian	1 oz.
Ginger	2 oz.
Fennegreek seed	4 oz.
Senna	2 oz.

Each finely powdered and mixed. The dose is one teaspoonful in slop or water, thickened with bran. These powders will tone and stimulate all the functions, aid the recuperative powers of nature, purify the blood and increase the mammary supply.

We have very little faith in any of the so-called hog cholera remedies and have no suggestions to make along this line.

I would say that success in hog raising and fattening does not depend solely on the judicious management of any one part of swine husbandry, but is due to foresight, proper care and judicious management of all parts.

PREPARING HOGS FOR THE SHOW RING.

BY I. N. BARKER, THORNTOWN, IND.

The first requisite in preparing hogs for the show ring is to be sure we have the right kind of breeding stock. Then arrange to have the fall litters come as near the last days of September or first days of October as possible. And the spring litters last of March or first ten days of April. By doing this we have the fall litters just the right age to select our show stuff for class "over six months and under one year," and the spring litters will be the right age to select show pigs for class "under six months."

While the dam that is carrying these litters before birth should not be fed highly on corn, as corn is too heating and has not sufficient bone and muscle elements in it to produce the strongest and best pigs, feed her on quite a variety of feed, such as mill feed made into a thick slop, together with a very moderate amount of corn, sugar beets, very early cut, sweet clover hay, ground oats, green rye, and also charcoal, ashes and salt once or twice per week. The above I consider the first preparation. But never neglecting to give the brood sows roomy lots, permitting plenty of exercise. Good comfortable houses for each sow separate from other hogs is a necessary preparation for farrowing; and when the little porkers put in an appearance extra care is necessary to save as near all the pigs as possible.

Feed the sow very sparingly for several days before farrowing and also for the first ten days after farrowing, so as to keep down fever. When these precautions are taken, the pigs will seldom be troubled very severely with scours.

By the time the pigs are three or four weeks old they should be eating quite freely in small pens near the dam, but so arranged that she can not rob them. If given such an opportunity they will learn to drink milk by

the time they are three weeks old, especially when it is placed in very shallow troughs.

As they advance in age they should have all they will eat up clean and no more, and this should be given three times per day, and if in hot weather, they should always be fed in the shade, being careful that neither pigs nor dam are fed too much corn. Sweet skim milk with wheat shorts and ground oats, with a small amount of corn meal together with about one handful of oil cake meal to two gallons of slop, fed as thick as it will cover, is our ideal feed in preparing pigs and hogs for the show ring.

It is surprising how much charcoal, ashes and salt hogs will eat when they are being highly fed, and this should never be neglected; and a roomy, grassy lot for them is also a necessity, as well as plenty of pure water.

But there are other things to look after in preparing hogs for the show ring besides what I have mentioned.

Their sleeping places should be kept as clean as possible and disinfected twice each week. Keep the stock free from lice by free applications of crude oil as often as necessary. Keep them tame and gentle by going amongst them and being very familiar with them, so they will not be nervous and wild when driven out into the show ring. When pigs have been bred right, and prepared as above recommended, they will grow to very large size and have plenty of style or finish. When you drive out in the show ring have them clean and in as attractive form as possible, and you are in good shape to win a liberal share of the prizes.

SHAPING STOCK FOR THE SHOW RING.

BY JOHN G. GARTEN, BURNEY, IND.

The most important point connected with success is in having and keeping a good breeding herd. You should select your breeding animals from stock that has as many noted ancestors as possible, as the best do not always produce show animals. Proper care of the sire and dam is laying the foundation of success with the pigs. The sire should not be run down. He should be fed liberally but not so that he will become sluggish. I find ground oats and shorts the best ration for a breeding boar, with a little corn and plenty of shade and water. To raise a show pig, the mother should be well matured, she should be fed so as to give plenty of milk at farrowing time; then she should be fed sparingly, gradually increasing her ration until she gets about what she will eat up clean.

The first month of a pig's life I find to be the most critical. To prevent scour do not overfeed, and if you do not want to show bobtail pigs the bedding should be changed twice a week at least. As soon as the pigs show signs of eating, a place should be fixed so that they can be fed to themselves. I feed ground oats and shipstuff and bran, as it produces bone, which I think is most essential in starting a pig. Now comes the time that tries the most experienced breeder in selecting the pigs for the show ring. Every breeder has, or ought to have, a mental photograph of the perfect animal he is trying to produce—his ideal. We want a good bone structure; then you have something you can rely on to build upon. When the pigs are four to six weeks old, I think, is a good time to select them for the show ring. Once right, while they may grow away from it under the most careful management, they are always apt to return to their first form than to grow out of or cover up a faulty structure. Always demand a good head and ear, with good, strong pole, a short neck, a strong back well ribbed, with the best ham you can get, straight top and bottom lines, set on good legs and feet, with a full heart girth, well flanked.

After the pigs have been selected they should be allowed to wean themselves and should have a grass lot to run in with plenty of shade. I often commence feeding stronger so as to make as much growth as possible. When the pigs are six months old they should be fed more corn or something that will grow more fat. I usually feed when fitting animals with age, white middlings or shorts and hominy meal equal parts and a pint of oil meal to two gallons of feed. Think this kind of feeding gives more bloom to the animal, and they will have a fine coat of hair. Aged sows should always be bred before being fitted so the young can suckle the fat off without detriment to the sow. Aged boars should not be fed too much corn as it is heating and injurious to the usefulness as a sire afterward. All hogs should be washed and cleaned up before crating. Do not use too much straw in crating as it is heating.

After you have arrived at the show ground and the pens are selected, see that they have been disinfected. Bed just heavy enough to keep dry. and when show day comes see that the hogs are clean and show dry. If they get too warm, use water with a solution of chloro-naphtholeum, as it gives a good gloss to the hair. If you are successful, you will know just how to act and what to say; but if some other fellow gets the ribbon you should then have courage of mind, treating the judge with respect, and be courteous to fellow breeders; and when you have arrived home go to work preparing for the show next year.

Breeding hogs is not, as has been said, a lazy man's business, but real hard, pleasant work if you love your business, and no man should commence shaping stock for the show ring without a genuine love for it. A taste for one's business and an ambition to succeed in it, is indispensable, and a lack of such qualities is only failure.

Every swine breeder should have an ambition to be successful. It takes knowledge, persistence, patience and constant attention to prepare stock for the show ring; it requires work, and no hog breeder can expect to be successful without it.

DO PUBLIC SALES BENEFIT THE BREEDER?

BY JNO. M. VANCE, SPRINGPORT, IND.

As to whether public sales do benefit the breeder depends upon his surroundings. It is a well-known fact that all breeders do not succeed in the sale business. I have attended sales where the farmers of the neighborhood seemed to care but little for the stock they were offered. They either could not or would not distinguish between a good animal and a poor one. The idea of improving their stock seemed to never enter their heads, and the breeder would be forced to sell at a loss and eventually abandon the business. But I am glad to say all farmers are not inclined that way. The spirit of improvement has taken possession of some neighborhoods, and the farmers will attend the annual sales. All seem to strive to get the best hogs; a few dollars does not stand in the way when good ones are in the ring. They know the value of good hogs and they will have them. Where a breeder has such farmers for his patrons he can make the sale business a success. I have been selling at public sale for about ten years, and I am satisfied I can do better selling my stock at public sale than any other way. It is not the question as to how to dispose of any one crop of pigs, but how to dispose of them from year to year. Then we must manage to build up a trade that will last, and as the pork barrel is the destiny of the pig, the farmer that raises him is the principal one to look to for a market for him, and we can depend on him for that where they are a live, progressive class of farmers.

It is a good plan to make a kind of a holiday of sale day. Farmers and breeders that are near enough are glad to come and visit each other. We can not make the sale business a success without the support of the farmer and the breeder also. The man who goes into the public sale business should strive to raise better pigs every year. The spirit of friendly rivalry should be cultivated among all breeders. We like to hear our neighbors say, "I want to have the best bunch of pigs that is sold in our market this year," and when the breeder can hear these same men say, "I bought my breeding boar at your sale," then we can depend on these men for regular customers. I also think it is better for breeders and farmers to see the pigs they are buying, a thing they do more at sales than buying at private sale or on mail order. Another benefit in selling

at public sale, we often get persons to come to the sale who are not in the habit of buying fine stock, and when they get there they are apt to buy something that will do them good, and we have now a regular customer. And not only that man, but his friends, will want some next year. So this thing works like the leaven in bread, it keeps on until all will want something better than they had at home. I am not in favor of "boom prices" or shady or unfair methods being used by the breeder. It is not the best way. We should avoid all unfair methods in selling at public sale, as it is sure to bring trouble in the end. With fair and honest dealing between man and man, and ever striving to raise better pigs, I know of no better way to sell them than at public sale.

WHAT BENEFITS ARE DERIVED FROM BREEDERS' MEETINGS?

BY LUCIEN ARBUCKLE, HOPE, IND.

No argument is necessary to prove that breeders' meetings benefit those interested in swine breeding.

One of the main benefits gained at swine breeders' meetings is the social advantage. There we meet breeders from all over the country, renew old acquaintances, make many new ones and in a friendly way review the business of the year.

Another benefit is the experience given by men who have grown old in the business. Their advice, if followed by the young and inexperienced breeder, places him on the high road to success, and possibly some young breeder may tell something that the older breeder had not yet learned. It is said, "There is nothing new under the sun;" but we must remember we are never too old to learn. So the men who have been in the business almost a lifetime can be benefited by attending breeders' meetings. Surely the young man just embarking in the business can not afford to miss a single meeting.

There we learn from the care of the boar down to the sucking pig; the proper feed and care of the brood sow for months before being bred up to farrowing, and from then on to the time when she weans her litter and sends them forth to root hog or die.

Then some other fellow reads a paper on handling of pigs from weaning time on, and we have a complete lesson on the breeding and caring for swine.

Again, breeders' meetings are often the means of selling stock, for we all like to tell the breeder just what we want and talk to him about what we are going to get.

We all make mistakes, and these we can have corrected when we come in contact with those who have solved the problems we are trying to learn. The breeders' meetings do more than any other one thing to put the breeding of fine stock on a higher scale as the years go by, and make the business more profitable to all who are engaged in it.

THE CARE OF PIGS.

The well-known swine breeder, Mr. W. J. Malden, of England, gives some interesting suggestions on the care and medication of young pigs, in the *Country Gentleman*, which should prove interesting reading to American breeders.

Little pigs can not stand against the disadvantages of a cold or wet bed. It is almost safe to state that no young pigs thrive if they are required to exist in a sty which has a cold floor; and that if, in addition to this, the floor is allowed to become wet and foul, the last hope toward profitable management is lost. At the time of pigging a small bed is found necessary, because if a large quantity of litter is provided there is a risk of the little pigs being smothered, but the bed must be placed in a dry position, and where no moisture can drain. If there is a dry place in the sty the sow will make her nest on it, but if the floor is uneven no such opportunity is given her, and she is obliged to make as good shift as she can. For a few days after the pigs are born the litter should not be changed for fear of upsetting the sow, unless she is of a very placid disposition; but when it is safe to clean out the sty the operation should be carried out daily. Little pigs will not thrive if the straw becomes wet and foul. The first signs of ill-effect are noticeable in a husky cold which frequently develops into a fatal pulmonary attack. Pig keepers know how often they notice that the "lights" are wrong when they cut open a little pig which has died somewhat suddenly. In almost all instances this is the result of being forced to lie on a damp bed; the less frequent cause is a chill brought about by the sty being draughty. Another result of a wet bed is rheumatism, a frequent malady among pigs; and no lover of animals can help feeling distress at the evident pain the little pigs suffer. They crouch about the sty and rapidly lose flesh, and if an effort is made to make them take exercise, they indicate the torture they experience by shrill squeals and long-drawn grunts. A small proportion of the attacks of rheumatism, it is true, result from injudicious feeding, which causes acidity to develop in their system; but in the majority of instances it is through the unhealthy bedding they are forced to lie in. There is a disease among pigs which, to the casual observer, is very similar to rheumatism, but which to an experienced pig breeder presents different symptoms; and it is very necessary that the difference should be

understood, because the treatment of the two varies considerably. The disease to which I refer is a kind of paralysis which causes the animals to lose their powers of locomotion, and is commonly spoken of as "going off their feet." This is due to errors in feeding, and can be distinguished from rheumatism because the pigs suffer no pain when touched, and therefore do not squeal when an attempt is made to make them move. They are usually in a listless and lethargic state, apparently caring little what is done to them, or what their surroundings are. The cause of this is that they are being fed upon food which contains a large proportion of nitrogen. When animals receive a too highly nitrogenous diet, the blood is surcharged with nitrogen, and presses so hard on the brain that ordinary symptoms of paralysis develop, showing themselves in the manner already described. The obvious method of relieving animals suffering in this way is to weaken the blood so that the pressure is lessened. There are various means of doing this, which may be followed according as the intensity of the malady shows itself. If the pigs are very bad, it is necessary to afford immediate relief by bleeding, when a rapid change generally takes place. Should the attack not be so intense, a small quantity of epsom salts should be mixed in their food, and the more nitrogenous parts of it withheld. Thus, if the pigs are receiving skim milk in addition to their mother's milk the skim milk should not be given. If food, such as bran and peas, is being given, more starchy foods, such as maize or barley meal, should be substituted for a time. In all the minor diseases of pigs which affect the digestive organs, nothing seems to exercise more beneficial effect than the herb known as betony, or, in some localities, madder. The medicinal properties of betony have long been recognized, and for a lengthy period it was largely used in ordinary medicine. An old Spanish proverb, when translated, runs as follows: "Sell your coat and buy betony," indicating in what esteem it was held before the days when a more scientific pharmacy was established. It is wonderful, almost magical, in its effect on pigs, for when they will not eat, a dose rapidly brings back an appetite, and if they are out of sorts the cause soon disappears. It may be given green or in a dried condition, and every pig keeper should grow a patch of it, so that an occasional dose of one or two tablespoonfuls may be given when required.

The use of corn in the feeding of swine has been dropped out until at present this grain is fed very little except as a finish for pork. We need nothing better than roots, milk and mill feed, in the absence of pasture, for a sow during the period of gestation and until the pigs are six weeks old, except in the coldest weather, and even then comfortable quarters are preferable to too much concentrated food for producing heat.

WEANING PIGS.

[From American Swine Herd.]

The time when pigs should be weaned, in a measure, depends upon their thrift, the season of the year, the accommodation and the feed you have for them.

We do not consider it advisable to wean pigs before they are two months old—would prefer more to less age.

Our early pigs we generally wean the first week in May, as we like to raise fall litters from a portion of the sows. Sows can ordinarily be bred within a week after the pigs are taken away. Sows that farrow in May and June will be too late to breed for fall farrow. It has been our custom to let these run with the sows until they wean themselves.

We prefer to have our sows with litters in as small bunches as possible; prefer a house and small yard with plenty of grass for each sow. If they are thus divided, and any of the pigs get out of order, you at once know what litter it is, and feed the sow accordingly. Most of the ailments of pigs before weaning will have to be reached by feed through the dam. Watch your little pigs very closely. If they look thin and hungry see that their dam is better fed and swilled—always increasing ration slowly or you will invariably scour the little fellows.

As it is next to impossible to raise a litter of pigs without some of them getting the scours, at one time or another, I will give you our treatment for their ailment. Watch the little pigs closely; if any of them are too loose, at the next feed dissolve a teaspoonful of copperas in a little warm water and feed it to the sow in her swill.

For two years I have successfully checked every case, and only four times gave a second dose, which I always give on the following day if the first was not effective. Have also seen copperas tried on cases of from three to ten days in duration, where it was not effective; therefore remember one stitch in time will save nine.

When pigs get from two to four weeks old fence off a corner in the house or in the yard, where the old sow can not get in, and give the pigs all the shelled corn they will eat. As soon as they are accustomed to coming for the corn, begin by feeding a little fresh milk diluted one-half with warm water. One cupful will be enough to begin with; then increase quantity as they learn to drink. Be careful there is no milk left in the trough from the previous feed, as it tends to sour the trough and the new milk:

If you are careless in this way you will do more harm than good. Remember the stomach of a little pig is as sensitive and delicate as that of a child. After you have them eating and drinking, so they will come when you call, and their stomach thoroughly accustomed to the feed, they are ready to wean.

Do not overlook the fact that by removing the sow you remove the sweetest and cleanest portion of its feed.

We want all the swill we feed to pigs under three months of age to be sweet, and then not too much of that; have at various times fed much soaked feed, but have discarded it entirely for dry shelled corn and dry oats fed in self feeders. We prefer dry feed for two reasons: First, in soaking corn, oats, ground or mill feed, it is next to impossible to keep the feed sweet in warm weather unless you have plenty of boiling water and rinse your barrels at each feed. Second, if feed is soaked, pigs will swallow whole or half kernels, without chewing the feed, thus being not properly mixed with saliva is hard to digest and may sour the stomach, while the dry grain is thoroughly chewed or ground. You can see this by the quantity of ground corn everywhere found where pigs have been fed dry corn.

WHOLE VS. GROUND FEED FOR HOGS.

Carefully conducted experiments are always worth a great deal to progressive breeders. The Wisconsin Experiment Station furnishes us with the results of an experiment made to determine the comparative value of whole corn and corn meal as a feed for growing pigs.

The corn used was No. 2 Western Yellow Dent, of fine quality. The corn meal used was ground fine at the regular custom flouring mills. In the experiment eighteen pigs were used, divided into two even lots of nine each, the experiment continuing twelve weeks. Lot one was fed the ration of two-thirds shelled corn and one-third wheat and middlings by weight. Lot two was fed two-thirds corn meal and one-third middlings wet with water and fed immediately after mixing. Each lot was fed one week on this diet before the proper trial began. Each animal was weighed separately and an account kept of all feed being given by weeks. The amount of shelled corn fed to lot one was 3,284 pounds; of middlings, 1,624 pounds; weight at the beginning of the trial, 1,907 pounds, and the gain 984. Lot number two consumed 3,971 pounds of corn meal and 1,985 of middlings; weight at the beginning, 1,886 pounds, and gain, 1,348.

The experiment was repeated with two other lots of hogs finer in bone and less vigorous in constitution, and continued for nine weeks. Lot one consumed 1,107 pounds of shelled corn and the same amount of middlings; weighed at the beginning 1,281 pounds, and gained 522. Lot two consumed 1,383 pounds of corn meal and the same amount of middlings; at the beginning weighed 1,383 pounds and gained 576.

Analyzing these experiments it will be seen that it required in the first trial 422 pounds of feed with corn meal to make 100 pounds of gain, and 501 pounds with whole corn to secure the same results. In the second trial it required 462 pounds with corn meal and 424 pounds with whole corn.

In the trial made in 1896, of which this is a duplication, it required 443 pounds with corn meal and 481 pounds with whole corn to produce 100 pounds of gain on the first trial and 487 pounds with corn meal, and 591 pounds with whole corn on the second trial of that year.

To sum up the two seasons' work Professor Henry remarks that the pigs made a greater gain when fed corn meal than when fed whole corn. "Taking the average of the four trials we learn that to make 100 pounds of gain the pigs were fed 456 pounds of corn meal and middlings and 499 pounds of whole corn and middlings. There is a saving of 40 pounds of corn on 499 pounds, or eight per cent. saved by grinding. This saving will barely pay for the cost of grinding corn."

Under the conditions west of the Mississippi it would certainly not pay to grind the corn at eight per cent. of its cash value when it is worth less than twenty-five cents per bushel. When corn, however, reaches forty cents and the farmer has a mill at home (which he can not very well do without) the answer would have to be very different.

The feed mill is a necessity on every well regulated farm for grinding corn, oats and inferior wheat for slop for pigs and calves, or preparing feed in short for any kind of stock requiring ground feed. It does not, however, pay, as will be seen above, to grind all grain for all purposes, and the object of this article is to point out the cases in which grinding will not pay when corn is cheap.

THE HOG DOG.

We don't know that any of our Indiana breeders stand in need of the "hog dog," as he is still found in some parts of the South, but it is interesting to know how he is used in that part of the country, where we still find the "razorback" in all his purity. Henry Wallace was down south recently and accidentally ran across a "hog dog," and this is what he writes about it:

"We called the other day at a lone house in the openings of a vast forest along the bayous, and while waiting for the appearance of the man of the house, who had gone fishing and had to be found by a messenger on horseback, we saw a hound, and asked the mistress of the home what that dog was good for.

"That are a hog dog," was the reply. "That dog is worth fifty dollars. Hog dogs are scarce in these parts."

"We ventured to inquire whether the dog would catch razorbacks, and she said: 'Oh, no! Hog dogs don't catch razorbacks; the razorbacks chase them.'

"On asking for further explanation, she went on to say that their hogs ran in the woods the year round without feed or care, and when it was necessary to find them they hunted for them the same as deer; that when

this particular dog was put on the trail of a hog he followed it up and located the herd by baying at them. The owner then indicated the direction in which he wanted the herd driven, when the hog dog made an attack on the herd which they resisted in force, and the experienced H. D. aforesaid allowed them to chase him in the direction in which the owner wanted the hogs to go. If any of them seemed inclined to go in some other direction, he ran around and got the stragglers after him, and led in the home direction. If he got tired and turned out, he rested a bit and then made another attack, and no matter how tired the hogs were they would take after him, and he continued this masterly retreat until the hogs were brought home.

"We were curious to know how the hogs were confined for slaughtering purposes after they arrived at home, and were told that the proper way was to build a log pen in the woods with an opening below large enough for both dog and hogs to enter and low enough for the dog to jump out and save his bacon, but so high that the hogs could not. The owner then was on hand and closed up the opening and had his winter meat ready for slaughter. We had heard stories of this kind before, but always supposed there was some joke about it, and it gave us a new sensation to hear this artless, simple-minded woman describing a scene that occurred every fall of the year when a hog harvest had to be gathered.

"Through all the pine and oak forests of the South and over not a little of the prairie region where corn growing is not a pronounced success, the razorback flourishes and will flourish until conditions are changed. Say what you like about him, he is the hog for that locality. Attempts to grade him up without changing the environment are as futile as pouring water on a duck's back or King Arthur's attempt to sweep back the waves of the Atlantic with a broom. The little pigs, whether from the wild or graded up breeds, in the full flush of their mother's milk, do not differ so widely as one would imagine from those of the improved types. When this milk begins to fail and the infantile razorback has to root for himself, he begins to take on the razorback form. It is the only form under which he could survive the conditions by which he is surrounded. Nature builds him that way because it is the only way in which he could make a living. From necessity he is an enterprising hog; intelligent, suspicious, courageous, a born fighter, a good rustler, shifty as a New England Yankee, and courageous as a confederate colonel. Nothing in the shape of food from the roots of grass and minnows in the fisherman's bucket, to watermelons or dead fish, escape him. He is hungry from the first spoonful of his mother's milk until the mast ripens in the fall; then his soul is satisfied. Whether it is the seeds of the pine cone, the acorn, or the pecan, it is all the same to the razorback. He has grown his frame under hard conditions and has developed a degree of industry, foresight, prudence, courage and energy, which, if used by his master in the prosecution of his business, would make the South the abode of rich men.

and when the harvest of mast comes in the fall he revels in a luxury which would satisfy the soul of a millionaire, and puts the streak of fat between the streaks of lean that makes his flesh, when properly cured and smoked, a fit feast for the epicure.

"Give the razorback his dues. He will hold the country until fenced pastures, tame grasses and cheap corn invade it, and then, and then only, is it worth while to grade him up."

MANAGEMENT AND FEEDING OF FALL PIGS.

The question with some farmers is what to do with the fall pigs. It is easy enough to handle the spring litter, but the fall pigs have to pass through all kinds of bad weather, which is very unfavorable for their growth and fattening. The idea of this article is to show that the fall pig, with a little extra care and management, can be made to thrive and fatten in winter as well as in summer. Dollars do not grow on bushes, fall to the ground to be gathered into baskets by man, but by great labor we are able to gather a few. During the winter months the farmer is not pushed with work, therefore it is just the time for him to look after the pigs. I find by my experience that the best time for sows to farrow for fall pigs is during the months of August and September. To have the pigs come then gives them the advantage of a little warm weather in which they can get a start before cold weather begins. The sow should be kept in good condition by the feeding of mill feed and a little corn and have the run of a clover field, so that the pigs will come strong and healthy, which is half the battle. From the time the pigs come until they are two weeks old the sows should be fed very sparingly on bran slop alone, after which increase it, gradually adding corn until you give them about all they eat. As soon as the pigs will eat they should have a run to themselves and be fed slop made by mixing mill feed with milk and kitchen slops. When they are six or eight weeks old the sows should be weaned from the pigs. Never pen the pigs. Let them have all the range possible. Feed them all the mill feed they will eat, but not much corn until they are three months old. If fed too freely on corn they will not grow fast.

When cold weather comes the pigs should be well sheltered. Have them warm, dry sleeping quarters and also a dry feed place. It should be so arranged that they will not have to go through the cold from nest to feeding place. After they are three months old give them all the corn they will eat up clean twice a day and a liberal quantity of bran slop at noon, but not all they will eat. Have them squeal sufficiently at each feeding time to let you know they will relish their feed when you give it to them. Pigs managed and fed according to the above directions

should weigh at four months old at least one hundred pounds and not be fat but good stockers. But if the feeder desires to keep them they can be made to gain, by the same care and feeding, from one and one-half to two pounds per day during the remainder of the winter. I have done this myself and am doing it this winter with thirty head of good grade Poland-Chinas, which will weigh to-day at five months old 150 pounds.

The main points to be looked after are good shelter, a warm, dry sleeping place kept free of lice by the use of coal oil, plenty of good drinking water, and feed at regular hours.

FATTENING HOGS FOR MARKET.

BY J. H. BONE, LAFAYETTE, IND.

I take it for granted that all who read this article are trying to prepare their stock for market in the most economical way. With this in mind I shall try to point out the reasonable way of feeding. In so short a paper only general facts can be stated. It goes without saying that if we want to produce anything we must use the right material in the right way. There is no need of guessing about these materials when it comes to feeding farm animals, for we have abundant information on the subject. Let us first examine the composition of the animal's body. Numerous investigations give approximately the following composition of the body of various farm animals: Bones, 9 per cent.; flesh and tendons, 40 per cent.; mechanically separable fat, 24 per cent.; blood, hide, entrails, etc., 27 per cent. To get at the problem more closely let us find out the composition of the body in terms that can be applied to foods. The pig's body has the following composition:

	<i>Mineral Matter.</i>	<i>Nitrogenous Matter.</i>	<i>Fat.</i>	<i>Water.</i>	<i>Contents of Stomach in Moist Condition.</i>
Store pig . .	2.67	13.7	23.3	55.1	5.22
Fat pig. . .	1.65	10.9	42.2	41.3	3.97

These percentages represent the body of the pig as it is when alive. The mineral matter mentioned in the table is composed largely of phosphoric acid, potash, lime and magnesia. This mineral matter is mostly found in the bones and is produced while the pig is getting its growth. The nitrogenous substance is found in the muscles, tendons, ligaments, hide, hair, hoofs, blood, nerves and organic matter of the bones. In the pig there is less mineral matter than in any other of our farm animals. In its body when fat there is four times as much fat as lean meat. While the average amount of water in the body of farm animals is about 49

per cent., the fat pig has but 41.3 per cent. and the store pig has 55.1 per cent. It will be noticed in a study of the table that there is a striking difference between the composition of the body of the store pig and the fat one. This difference is caused by fattening. In the fattening process the pig does little but lay on fat. There is an increase in the amount of dry matter in the body. Scarcely any mineral matter is added to the body and rarely more than 7.5 per cent. of nitrogenous substance, the fat forming about 70 per cent. of the increase. Of the gain in weight during the fattening process about 75 per cent. is dry matter and 25 per cent. is water. Keeping in mind what we have learned let us examine some of the materials used for the production of the body. All animals require a certain amount of food for maintenance. It is probably about right to say that two pounds of feed such as middlings or of their value will maintain 100 pounds of live weight. Until an animal receives more food than is required to keep up the heat of the body and supply the waste of the body, it can not gain in weight. It should be the object of every feeder to keep his stock gaining every day. All foods will not produce the same effect. Some are fat formers while others are flesh formers. While pigs are growing they should be supplied with food that will form flesh, or lean meat, and also furnish an abundant supply for the growth of bone. Unless the proper food is given, pigs will not thrive well, or they will become too fat and mature too early, after which we feed at a loss. Indian corn is a food that will form fat and contains a small amount of protein and mineral matter. As a food it is not the best for growing pigs or pregnant sows when fed exclusively. It is admirably adapted for fattening and we could wish for no better food for hogs after they have reached the proper age. Corn with good pasture will make pigs grow well. It is probable that more pigs are raised and fattened on corn and pasture than on all other foods combined. There is a part of the year in which we can not have pasture, and growing pigs should have mill feeds in addition to corn. Mill feeds furnish a high per cent. of flesh-forming materials and much mineral matter. They will also keep the pigs in a healthy condition. This paper is too short to make any adequate discussion of foods. I want only to emphasize the fact that we ought to use our judgment and knowledge even in feeding pigs.

A WORD FOR THE HOG WALLOW.

The wise breeder always consults the comfort of his stock in summer as well as in winter, if he expects to reap the best results for his labor. The hog wallow is not generally looked on with favor, but rather as a germ-producing and disease-breeding nuisance, altogether out of place on any well regulated farm. A correspondent in the *Stockman and Farmer*, and a successful breeder as well, gives his experience with the wallow.

"What do I think of the wallow? Well, you see I've got one, and can say that I have never lost a hog from disease, so in my case at least it has not proven such a death trap as some writers make it out to be. These writers generally have a 'Doctor' or 'Professor' to their names, and are able to bring such an array of facts and scientific reasoning to bear that one is forced to believe that he must banish the wallow or lose his entire herd of swine.

"It is one of the rules of nature that nothing thrives out of its natural element. It is the nature of a hog to take to the mud just the same as the hippopotamus or alligator, and for the same reason. We read that there is no animal more cleanly than the hog, but that is all romance. I don't say you can't keep hogs dry and clean and healthy, but I never saw it successfully done yet. The value of my wallow during the heated part of the season can not be estimated. There is little if any danger of loss from heat if the swine have a shady wallow to lie in during the hot part of the day. Without one there will be great loss of fat if not of animals.

"As to disease germs, I do not see why the wallow is condemned so much on that score. If I understand the nature of these germs they must be planted by infected animals. In this way a wallow might be the means of transmitting the infection, but the drinking troughs and feeding grounds are more liable to become impregnated, and as it is admitted that the disease reaches the system through the stomach they are far more liable to transmit the disease and should accordingly be sources of more anxiety to the hog raiser.

"The greatest danger in a wallow is that, through carelessness or indolence on the part of the feeder, the swine are forced to look to it for a supply of drinking water. No animal will thrive on impure drinking water, not even a hog. Nor will he drink it until forced to. It is my honest belief that for every case of cholera transmitted from a mud-hole you will find ninety-nine caused by impure drinking water or an exclusive corn diet. Give me the right sort of feed and pure water, and I'm willing to chance the wallow. To those about to try the dry pen and pasture, I would advise to think of the hot July and August days and use their own common sense rather than the advice of 'educated' but inexperienced individuals. I consider my wallow a necessity to successful swine raising."

CROSSING BREEDS.

It has been suggested by high authority that Tamworths be crossed upon our present popular breeds to give us a better bacon hog. Mr. W. M. Boomerger, in the *Prairie Farmer*, suggests that this kind of crossing is not improving, but destroying already well built foundations. Environment and what is commonly known as line-breeding that does not go too

near in-breeding is that which more nearly improves and develops healthy and vigorous organization. The Tamworth of Great Britain will, if kept a sufficient length of time under the conditions that have developed desirable types in other breeds in this country, give us what we want by selection, and the noses of that breed can be shortened. In the presence of our vast western corn cribs it is probable that bacon hogs can be developed out of the Tamworth without contaminating blood of other breeds and going into raising mongrels. There is nothing wrong at all in developing what is needed by the markets out of the breeds already so near perfection, be they Berkshire, Poland-China, or Chester White, by proper selection and feeding. If such is done, a more desirable type will at once be placed on the markets and the mixed mongrelism, that good farmers have been fighting and trying to get off farms, will not be again at hand to flood the markets. There are types in the breeds that are rangy and do not take on fat so fast, and a little less high feeding and more reliance given to getting growth of hogs on large pastures, and giving them plenty of exercise, will produce the result. If we have been nearly half a century developing a breed, as we have the Poland-China, and it is found in a high-bred form and the breed widely used, and whether it be the Berkshire or Poland-China we would feel like protesting against this work being destroyed by widespread crossing. While we believe that packers know what they want, and the demand should be satisfied, we think that the talk of there being need of more bacon hogs is largely talk, for the very reason that no special prices are offered by the markets for that kind of hog. Let the markets make 50 cents to \$1 per hundred weight more for bacon hogs and the farmers will soon produce them out of the present breeds without exploiting in the crossing business that would destroy the very foundations of the swine industry. It seems exceedingly convenient for the markets to always demand just what can not be supplied, and make it a claim to bear the prices of what farmers have to sell. Breeding for breed improvement and breeding for market should be co-ordinate and we think it would not be necessary to destroy well-laid foundations to produce the bacon hog.

SURE AND QUICK RETURNS.

Every swine breeder in the country is in the business for the money there is in it, and the quicker the returns come in the larger the profits, as a rule. On this subject Mr. A. J. Lovejoy, of Illinois, suggests that the hog stands to-day, and always has, superior to any of our domestic animals as a money maker. It has been said that for big money breed horses, for sure money cattle, but for quick money hogs. Yet to-day we might combine all three sayings in the latter, as the breeding and feeding of swine most assuredly pays the general farmer better, surer and

quicker than any of our domestic animals, not even barring the dairy cow. What can a farmer find for the small amount invested in ten good brood sows, safe in farrow, of any of the improved breeds of to-day, that will bring pigs in the spring, that with proper care and liberal feed will during a twelvemonth return such a profit on the investment as will these self-same ten brood sows and their produce?

Good, well-bred pigs, farrowed in February or March, the earlier the better, by being properly cared for during the first three months while with their dams, until good grass comes, preferably the clovers, and then weaned and put on clover pasture with a good, dry place to sleep and in addition to the clover have all the shelled corn, soaked until softened, together with what wheat and middlings as a slop they will eat, can be made to weigh about one pound per day from birth, and by October 1, or any time before the large run of fall hogs are ready for market, bring ten to twelve dollars per head in the average market, and show a grand good profit for all feed consumed. The reason I speak of shelled corn soaked is that I consider it, when combined with clover pasture, a well balanced ration, and by soaking it the pigs will eat much more than they will from the ear. The liquid or water in which the corn is soaked should by all means be given to the pigs, either as a drink or mixed with good wheat middlings, for this corn juice to a hog is like beer to a Dutchman, it helps to round him out.

There is another profitable way. This is by raising late summer pigs, that may be weaned say by September, and then have the run of the pastures, though there may be but little grass at this time of the year, but what there is, together with a good feed twice daily of ground wheat, wheat middlings or ground rye, will push them along nicely. On many farms pumpkins are grown, which make a grand good fall feed for pigs or shoats, especially when a little green corn can be fed along with them. Shoats of this age with good dry shelter in which to sleep during the winter can be carried through at a small cost. If a field of fall rye sown very early, say in August or September, can be had for them, it will furnish green feed for the whole winter when not covered with snow, and this with a feed or two daily of grain will keep them growing and thriving at small expense, ready for early grass and heavy feeding to finish for a summer market, which by comparison will be found for a series of years to be the highest of the year.

FEEDING SHOW PIGS.

As one looks in upon the pens of fine pigs as they are shown at any of the leading fairs of our country, the wonder is, how have these animals been fed and cared for to bring them to such a high state of perfection. One of the most successful exhibitors in the whole country, Mr. Reuben Gentry, of Kentucky, gives his method of pig feeding as follows:

Granted that you have selected your litter from which you wish to take your show animals. You of course can not pick out any special individual at so tender an age. Hence must feed the whole litter, which at first can not be done except through the dam. After all danger of milk fever is past begin to feed her the following ration, gradually increasing to all she will clean up, avoiding an overfeed above everything else, for a setback at three weeks can not be overcome at three months. Shipstuff, bran, corn, ground oats, each one part by bulk cooked by steam, if possible. Feed to sow in slop made with greasy dish water and milk three times per day. As soon as pigs will eat (which will vary somewhat from three weeks to a month) place small trough in pen where sows can not get to it and feed in small quantities at first the same ration except leave off the ground oats, a pig's stomach at that age not being able to properly digest the oats unless ground very fine and the hull sifted out. Watch bowels closely that you do not scour them. The plan of prevention being worth all the cures, put a small quantity of powdered charcoal in slop. Do not feed much at a time, but often, cleaning out all that may be left each time before putting in a fresh feed. As they get older, say six weeks, add the ground oats and increase feed in richness by adding common flour. Let run with dam until they begin to think more of you and your bucket of warm slop than they do of her. At four months pick out two or three of what in your estimation are the best ones, place in a lot with plenty of shade and pure water to drink; you can now add a small quantity of corn meal to the previous mixture and increase the flour. Three weeks prior to show feed four ounces of molasses to each hog, at first only once per day, gradually increasing to six ounces three times a day. Leave off corn if weather is hot and double the ration of flour and oats. I have not said anything about feeding milk, knowing that you all know that it is the first thing in importance in feeding for successful exhibition. Some one may say, Oh, the cost of all this. Well, if you are going to stop and count the cost never try to prepare for the show. You are working for a reputation and your profits must come out of your future sales. Feed in this way and my word for it when you go to show if you have the individual you will get your share of the coveted blue ribbon, and when the fair is over you will have a sow that will breed without any trouble, and a boar that is active and will sire you more and better pigs than one not so fat. Do not on your return quit feeding and let them shift for themselves, but gradually decrease feed.

DO PUBLIC SALES BENEFIT THE BREEDER?

BY W. ARTHUR AYERS, OAKVILLE, KY.

Let us first look at some of the advantages that accrue to the breeder from public sales. There is nothing that brings breeders together better than a public sale of good stuff, if it is well advertised. This is a great benefit to the breeder, from the fact that he has his stuff valued from other breeders' standpoint; his mistakes in breeding are pointed out and made to show up in such a light that he will see them, no matter how narrow-minded he may be. and, if he is the man he should be, will profit thereby. Another very great advantage to be gained is, he keeps his stuff together, does his own developing until every one can see what they will make, thereby lessening his chances of putting out a pig that, when he comes to himself, would do his breeder an injustice and make him ashamed of having bred such a hog, to say nothing of the disappointment that comes to the buyer. To cite a case, a neighbor of mine bought a pig from one of our most prominent breeders—one noted for his honesty and fair dealing. This pig was bred in the "royal purple." When he came the man thought he had a fortune. I saw him a few days afterward and he insisted on me coming down to see his great (?) pig. He was nice—there was no mistaking that—but by the time he was six months old, the neighbors said, he was only tolerable, and by the time he was one year old they all said. "Well, he ain't no great shakes." You all know how an old farmer can say that, and what a great deal it seems to express. I saw this hog when he was one year and eight months old, and I thought he was a disgrace to any fattening pen on earth. A man told me this pig never did show much wrong with him until after he was six months old. Now, what would this breeder say if he was to see this hog? Would you think he would want to say, "There is some of my breeding"? Verily no. Now if he had kept this pig for a public sale it would have been old enough to have shown these defects and have been sent where it belonged—to the fattening pen. This is only one of many such instances that have come under my observation, yet I do not know of one in which the breeder is to be blamed. In this case I know no one is to be blamed at all.

Again, the men who buy at public sales are generally men that want a good hog because they need it, and will do their best to bring out everything good in their purchase, making it a lasting advertisement for the breeder; while, by selling privately, often we sell a pig to a man and he turns him out on the commons to "root, hog, or starve," and because he does not make a "stunner" he curses the breeder for it instead of his own triflingness. Our first investment in pure-bred swine was at a public sale.

and I have often thought it was our best for the money invested, although we have always gotten our money's worth whenever we bought pure-bred swine privately. Another advantage to be gained is that the purchaser sees the stuff he is buying and can not blame any one but himself if he does not think he got what he should. And often when depending on selling our hogs through the advertising medium of our stock journals, people are afraid that this thing of pure-bred stock is to be classed with some of the fakes that are so well advertised. If you have an extra nice lot of stuff that breeders want, you have them together and where purchasers can see what they are buying; and rest assured, my friend, a swine breeder knows the plums as soon as he sees them, and, being able to sympathize with you, is willing to pay for what he needs.

I think where conditions are favorable and the offering is what it should be, public sales will net a man more ready cash than private ones, and usually they are more satisfactory to the purchaser. Of course every advantage has its disadvantages, and public sales are no exception. Living, for that matter, has its drawbacks, yet how many of us are there but what want to live as long as we can? You run some risk in getting bad notes if you are not careful, and also know when to say no. You may not have a good day for your sale or your hogs may get sick, or, nearly as bad, if not quite, is your hogs may be all right, but disease breaks out in the country about you, making every one afraid to come to your sale, to say nothing of being afraid to buy. You may not have a good day for your sale, any or all of these may and can happen, and you may not live to see your sale day, or, if you do, may die before your notes are due, for that matter, and then your sale would be a failure so far as you individually are concerned. But, brother, do not let too many little ifs, buts and ands discourage you, but if you have the stock and advertise well, besides doing all other things necessary, you stand a fighting chance, at least, of proving that public sales are a benefit to the breeder—one at least.

WHAT IS THE SCORE CARD?

Questions are frequently asked about the score card—what it is, how are the points divided, and the like.

The score card is a numerical division of the hog from the standard of perfection, or 100 points, and is divided into twenty sections, a special value being placed on each division according to its importance to the general conformation of the hog, its constitutional ability and its commercial value. In addition to the detailed description, it describes a perfect condition of each point, and the detailed description also describes objectionable conditions. The successful use of the score card is the ability to place a proper and correct valuation on each point. The score

card stands in the same relation to swine breeders as a questioner to a class of students. It is continually asking the question, Why?

A hog is before you, and the card is placed in your hands. The card says the value of the head and face is four points out of a possible 100. Why will it not average that much? The detailed description tells you that the head and face and all other points must have a certain form as described to be perfect, and that such descriptions as appear under the objections, are to deduct from the general average of that head, and so it continues throughout every point.

The following score card is uniform with the revised card adopted by the National Association of Expert Judges of Swine, June, 1896:

Scale of Points.	Number Points.	Points Off.	
1. Head and face	4	. . . . .	. . . . .
2. Eyes	2	. . . . .	. . . . .
3. Ears	2	. . . . .	. . . . .
4. Neck	2	. . . . .	. . . . .
5. Jowl	2	. . . . .	. . . . .
6. Shoulders	6	. . . . .	. . . . .
7. Chest	12	. . . . .	. . . . .
8. Back and loin	14	. . . . .	. . . . .
9. Sides and ribs	10	. . . . .	. . . . .
10. Belly and flank	4	. . . . .	. . . . .
11. Ham and rump	10	. . . . .	. . . . .
12. Feet and legs	10	. . . . .	. . . . .
13. Tail	1	. . . . .	. . . . .
14. Coat	3	. . . . .	. . . . .
15. Color	3	. . . . .	. . . . .
16. Size	5	. . . . .	. . . . .
17. Action and style	3	. . . . .	. . . . .
18. Condition	2	. . . . .	. . . . .
19. Disposition	2	. . . . .	. . . . .
20. Symmetry of Points	3	. . . . .	. . . . .

Judge

Total 100.

Score of Animal

Date Breed

As to the advantages of regular scoring schools, Mr. J. C. Bridges says:

When we are busy looking after our little herds, admiring this one and that, and think we have something very fine, a neighbor comes on the scene and makes inquiry about your interests. You at once begin to describe this hog and that, and many others. Very natural he may take exceptions and say he don't like some parts and we at once go into a discussion over the subject. Here is where I understand are the advantages of a score school. May I ask a question? What is a score school? It should be where men of different breeds get together and unite on a maximum and minimum cut for the different imperfections.

The question is being asked why should you mark thus so and so. At a scoring meeting you are provided with a card setting forth the hog in a numerical division for a standard of perfection of 100 points. The score card, being marked off, the different parts, according to their vital value, such as, for illustration, the head, marked five points for perfection. You would mark it four or four and one-half points. Again the girth around heart, marked ten points, we will give it eight or eight and one-half, and when you have gone through all the different points and added up, your total may reach seventy or perhaps seventy-five. Some other has scored perhaps eighty, another seventy-eight, and so on through the list. As you are scoring, a committeeman is also going over the hog, as he thinks it should be. After all are through, the cards are given to the committee and the questions are discussed by the meeting. Why such and such points are marked short of perfection, which call for a continued discussion. After you have scored on several breeds and wish to be identified as an expert, a committee of three takes your case under advisement and makes a report, sometimes to the dissatisfaction of the applicant. Now this is one very good feature in the advantages of a scoring school. It prepares a person to tell the reason why you make your decisions. I know of some good hog men who have raised hogs all their lives and have good ideas what a good hog is. But put them in a position as judge at some fair and ask them why this one took the premium over the other, it frequently bothers them to give an answer. We have good hog shows at our county fairs, and the fair managers want justice done in all departments. In having a school of this kind it helps the managers out by knowing who is competent to pass on rings. And again if a person is a good judge it helps them to select their stock to keep as foundations for herds. As a rule the best judges of good stock have the best to select from.

SOME POINTS IN SWINE BREEDING.

BY JNO. M. JAMISON.

CAPACITY OF THE BROOD SOW.

One class of hog growers claims that a sow which only produces one litter of pigs a year gives a much fairer quality of pigs than if she produces two. Yet the push of the times forces upon the breeder the practical belief that he can not afford to keep a sow a whole year for one litter of pigs. While one litter costs too much to start it, more than two are unprofitable, because they tax the sow beyond her limit of endurance. The only possible way to get more than two litters a year is to breed the sow while the pigs are sucking, either when they are three days old, or when five or six weeks old. To have a sow breed when the pigs are this latter age, she must be kept in high flesh. But few men in practice do this, because they do not believe a sow should be fat when she suckles her pigs, or because they have not the skill as feeders to keep her in this high condition. Because a sow comes in heat at this time, whether in moderate condition or fat, is no true indication that she should be bred. Breeders practice breeding to some extent at that time, but they recognize that there is a limit beyond which they can not pass without loss.

The evidence bearing on this point is strong enough to establish a safe rule to follow. Sometimes we meet a farmer who thinks a sow can be profitably bred any time she comes in heat, and if bred at this time to a strong and vigorous male she will bring strong pigs. We have tried to get two litters a year by letting the pigs suck till ten weeks old, and breed the sow shortly before the pigs are weaned, or within a week after. The plan works very well for two or three times, but if continued farther we have failures. The number of pigs in a litter will be smaller and of poorer quality.

Last spring we had two strong sows that did not save as many pigs as they should at farrowing time. On this account it was easy to keep them in high flesh while suckling the pigs. When the pigs were five or six weeks old the sows came in heat. If we waited till the pigs were weaned to breed them, the fall litters would be later than desirable. On this account we concluded to breed them as an experiment with the hope that it would bring profitable results. One sow brought six strong pigs that have done well. The other farrowed thirteen and saved ten. So far as we are able to judge, the pigs are as good and have done as well for us, as if the sows had not been bred till after the pigs were weaned. The

sow farrowing thirteen pigs was fed on pumpkins and corn, and had all the clover she could eat besides. The breeding boar had the run of the same field, and other sows were being bred, and to our surprise this sow came in heat when the pigs were five or six weeks old and was bred. We hardly expected that she would stand; however, in time she proved to be in farrow. Then we were in doubt as to results, as she was slow in developing form, and slow in starting milk secretions. At farrowing time she brought eight pigs and saved seven. As we feared, the quality of the pigs was below the average. Three of them were runts and always will be; they are doing well, but will always keep about the proportionate distance behind the others that they were when farrowed. These results from crowding the sow are in accord with previous experiences of our own, and of others who have given the matter close attention. When the present litter is weaned we will give the sow time to recuperate before breeding her again. All that will be necessary will be the length of time between the first and second time she comes in heat after farrowing, which is usually about three weeks. The first time she will be in heat, in three days after the pigs are taken away from her, she will be well fed from this time till the second time, when she will be bred. Being well fed, she will be gaining, and will doubtless do well next time she farrows. In our experience, this three weeks' rest is very necessary to keep a sow up to her full working capacity. If not allowed she is soon worked beyond her powers of endurance, and no one suffers from the results more than the owner. The weakened vitality shows first in the offspring in decreased numbers and quality. This overwork in the management of many farmers sends first-class brood sows to the fattening pen, condemned as worthless, when they should be just reaching their prime. And these farmers never take a thought, or reach a just conclusion as to why the sows failed. Animals in our care that should be profitable too often have to take the blame of failure, when we alone are the cause.

BEDDING THE SOW.

All pig growers have their preferences and prejudices in this matter. Some use forest leaves and prefer them to anything else, but to have these in supply requires that they be gathered and stored when they fall from the trees in the early fall; otherwise, they are drifted, they get wet and are unfit to use. To store a large quantity requires more room than most farmers can spare for this purpose. With straw it is different, While it is best to have it under roof, still if it is well stacked dry straw can be had at any time to bed the brood sows. While we have used leaves, straw and fodder, and could have a liberal supply of leaves to store each fall, if we had storage room, and could make room if really necessary. we think straw, on account of its many

good qualities for this purpose and the ease with which it may be kept is preferable to either leaves or fodder. In using straw we have found that oftentimes the bed need not be changed more than once a week. This is governed very much by the condition of the weather outside the house, if the sow has outdoor range. We make it a rule to change the bedding when we notice particles of straw, short pieces, sticking to the sow when she leaves the nest. When it is cut up this much it is getting fine enough to cause more or less dust. While in times past we have partly changed the bedding every day, we have concluded that it is too costly an effort toward cleanliness, and besides we do not regard this daily work as necessary. The breeder will take care not to bed the sow with new straw just before farrowing. To prevent being caught, he must know when the sow is due to farrow. She should have a good clean bed of straw two or three days before farrowing, and in sufficient quantity to meet needs at that time, and allow what becomes wet and soiled to be removed, and not require the bed to be replenished for two or three days. There is a question, and diversity of opinion, as to how much straw a sow should have for a bed at that time. A sow, when allowed her liberty in the woods, will gather for her nest as much as a wagon box full of leaves, sticks and whatever she can find conveniently, and out of this incongruous pile, after a few days, bring a strong, vigorous litter. But when brought to modern requirements in the use of shelter, and supplied bedding, maternal instinct seems to have lost its force to a considerable extent, and the owner must exercise a certain amount of judgment in her management if he would have her succeed well with her pigs. Since we have been growing pigs, this is the first year that we have not had, and could not get, good straw to bed our sows. As we did not have room to store leaves in season, we have had to depend entirely on fodder. As this product is unusually abundant, we have been able to keep the sows that now (the middle of March) have pigs six weeks old, well and comfortably bedded. About a week before farrowing we put them in separate lots, and put two or three good-sized bundles of fodder in each house. Before farrowing time they had this fodder well broken and torn to pieces. A visiting farmer inquired how we got the fodder in such good shape for the beds. At farrowing time we found it as desirable as straw; at any rate the results were as satisfactory as we could hope to have with the use of straw as bedding. A number of times, after farrowing, we did not use the whole stalk, but broke—or cut—the bundles in two about the middle, giving the sows the tops for their beds. Now, we use the fodder whole, pushing the bundles into the houses at the small doorways. The houses are six feet square, and it requires some mashing or breaking of the tops, as they are pushed in, top first, to get the long bundles into the houses. Three bundles, with the ties cut, cover the floor of a house very completely, and putting them in tops first places the finer parts of the fodder where the pigs and their dams find it most comfortable to nest.

From what we know of shredded fodder, we are led to believe that it is superior to straw for beds for sows and other swine stock of the farm, that is, taking the whole season through. We have a rail pen covered with fodder adjoining our feed lot at the barn, in which our brood sows are sheltered. They keep the nest comfortable and clean, with the cornstalks they carry in from the feed lot. Usually we have a straw stack in the feed lot that the sows bed and shelter about, but we find the cheap temporary shelter, bedded with cornstalks, more to our notion than the protection they get about the straw stack. Here they keep dry, and their bed does not get dusty—two points that are hard to secure about a straw stack. In cleaning out the soiled bedding made from fodder, from the small houses, we do not find it more unpleasant or difficult than it is to clean out the soiled straw. When we do this work, we use a hoe, working from the outside.

SINGLE HOUSE SYSTEM.

No animal on the farm can be sheltered more cheaply and satisfactorily at the time of parturition than the brood sow. This statement will cover a greater part of the large swine producing area of the United States. Two important features only are to be considered as absolutely necessary—warmth and dryness. These can be had by the use of different materials, cheap or expensive, as suits the fancy and pocketbook of the builder. A single shelter or house for each sow we think much preferable to the structure that will hold several animals. It is advisable for a herd of brood sows to farrow as near the same time as possible. When this is accomplished the houses can be put two or three rods apart, and will answer the purpose as well as if a greater distance, provided there are dividing fences between them. It is hard to get a lot of sows separated so far apart but that they will hear the herdsman when he commences to feed, and all be on the alert. This expectation for a share of the feed is against the large house that will accommodate a number of sows, as the sow will often leave the nest at farrowing time to go to the feed trough, usually to the detriment of her litter.

If separated from her companions far enough for them to be fed without disturbing her it is much better. Again, if separated in this way, it is much easier to keep litters from mixing until such a time as there is no danger of the strong pigs stealing from the weak.

In a herd of sows there is often one that is not as good a milker as the others. In a case of this kind nature does not limit the number of pigs to suit the supply of milk. She is as apt to produce a numerous litter as the best milker in the herd. The result is that these little fellows are always hungry, and spend much of the time pulling at their mother. If the sow is in a house with several others with litters, these hungry, restless fellows will cause much unrest with the others. We have often

noticed that when one litter of pigs begins to trail after their dam for their feed the litters of the herd are almost sure to take up the cry, and in a short time all the sows are down and the pigs sucking. When the sows and their litters are separated until the pigs are at least one month old it is much easier to feed each sow properly and get the pigs to eating. And, more than this, it is conducive to better thrift and health.

For single houses to be used in this way we would want them portable, or of material that could be torn to pieces and removed when not in use. The latter is the least expensive, and within the reach of every farmer able to own two or more brood sows.

PIGS ON GRASS.

There is an impression with many that the pig should run on grass without grain, that he will gain all the faster when he comes to the grain ration.

Careful experiments made to show the value of grass without and with grain show that there is little gain from grass alone. Farmers must get away from the idea that there is profit in the long run from keeping pigs for a time on pasture without grain. If you want the most out of a pig he must pay for his feed all the time and a little besides. We have never seen the grass so fine but the pig would take a little grain with it, and vice versa. If the water and feeding grounds are some distance apart and good pasture intervenes the pig will hardly eat so much grain but that he will graze as he goes back and forth between the grain feed and water. When grain is fed while they are on pasture but little of it is lost to supply the wastes of the animal system or to offset the absorbing waste of cold. And then how much pleasanter to feed on grass than on frost and snow.

In feeding corn to pigs that have the run of good pasture we have no arbitrary rule as to how much they shall be fed, but are governed solely by their appetites. When they come with a rush for the feed then we feed liberally, but if they are slow to come to the feeding ground we cast out the corn with a sparing hand. If we go to the feeding place and see corn left from the time of feeding before we feel that we have blundered and overfed. If pastures are parched and scant we regard it as absolutely necessary that the pigs have a grain product that will come nearest giving them the grass properties, such as bran and middlings dampened.

When new grain is to be fed there is no better plan than to give it with grass, and in limited quantities till the pig is accustomed to his feed. The aim should be to keep the pig comfortably full but not wholly on corn, other grain or grass, but a combination. Then the growth and gain will be more even and rapid, and at a less cost. The rule should be when grass is plenty to feed what grain the pig will come to each time with a relish.

CLOVER HAY FOR SWINE.

All successful swine growers readily concede the advantages in growing clover in connection with other crops grown for their hogs. It is regarded as the best crop to grow preceding a corn crop. Pigs grown with the aid of clover pasture if properly handled always yield a good profit on the care and feed invested in them.

The plea against pigs grown in winter is the lack of growth secured. Without the muscular and bone development they cost too much. The main reason for the excessive cost is that the ration they get is improperly balanced. Usually young hogs carried over winter get a sufficient quantity of feed, but it is not the right kind. It is generally recognized that bran and middlings fed as slop will correct the error in the ration of corn, but too many farmers are slow to purchase these products; they feel that they cost too much, and as they are usually fed there is much truth in this claim. If pig growers can be brought to believe that clover is as necessary for swine in winter as in summer they will consider the possibility of carrying the summer conditions into winter as much as possible. We can not have the green, succulent growth of summer during the winter, but we can have the cured—or dry—product of the plant. Many farmers think they can not make clover hay and that it is poor feed. Such men, if they are hog growers, must learn to make good clover hay, then they will soon know its value. Not only for the horse, cow and sheep, but also for the pig.

The stumbling block in its use for the pig is how to feed it. While all know that the pig revels in green clover, eating right and left as he wades through the strong, rich growth, they are slow to believe that hay will be eaten as readily. Cut up your clover hay and make a chop feed, mixing in bran and shorts just as you would do for your horse or cow, and you will find that it is relished by the pig and that he will thrive on it just as well as other stock.

FEEDING WHEAT.

Wheat is an excellent feed for swine, if ground and mixed with other and lighter feed, the mass being made into slop. Have had no very satisfactory results from feeding whole wheat, especially when fed dry. By soaking, whole wheat can be fed to considerable extent without loss. For young pigs, where growth is the essential point, sloppy feed is superior to dry feed of any kind. For growing pigs never use pure ground wheat. Oats, or heavy bran, or both, should be added. Some succulent, or bulky, food should always be given with this concentrated food, thus aiding digestion and sustaining the appetite.

MATURE BREEDING ANIMALS.

BY THEO. LOUIS, DUNN COUNTY, WIS.

Experience leads me to say it is to the advantage of neighborhoods or districts to adopt the same breed of hogs for the reason that boars can be retained to a greater age and maturity, provided a strict record of their line of breeding is observed, in order to avoid injudicious inbreeding. There is an ever growing tendency to breed from young, immature stock, the breeders being roused by the demand of the markets for light-weights of tender age. We should bear well in mind that while the art of breeding has developed hogs of all leading strains which at the early age of from eight to ten months fill this requirement, this early maturing falls far short as to maturity for breeding. In no line of live stock is this law of maturity for breeding so much disregarded as in the breeding of swine. The frequent complaint that this or the other kind of breed does not respond properly to feed in the line of growth, and seems to be subject to difficulty in gestation, deficiency in number of pigs to the litter—these and many other complaints are seldom charged to where they properly belong, viz., to immature breeding, injudicious selection, and the indifference in the selection of food to develop them. If more mature sires and dams were retained, those that have proven themselves capable of reproduction and improvement, as to uniformity, prolificacy, good mothers and milkers, that have been perfected and developed to full size and vigor by age—only by the use of these can we expect to retain the improvements handed down to us by master breeders. When indifference is replaced by proper selection and retention of the best, improvement is the sure result. Is it not the duty of the farmer and feeder to acquaint himself with the laws of breeding which tend toward steady improvement? The above recommendation in regard to the retention of sires is most necessary to success and improvement, and carries most weight without further comment.

A BAD PRACTICE.

Another practice that has a tendency to depreciate the standard of excellence is to allow hogs liberty to serve sows ad libitum, and to be turned out with the herd or confined with a number of sows in a yard. Is excessive service less harmful to future offspring of swine than of other live stock? One service as a rule will give satisfactory results as to the number of vigorous pigs, while when the other system is followed small litters, dead pigs, deformed pigs are the result, but in swine breeding this is ascribed to bad luck, while the horse breeder would charge

it to excessive use of the sire. Build a paddock or yard four or five rods square, with a shanty-like house seven by eight feet, seven feet high in front, five feet to rear, with a door two and one-half by four feet high to permit of entrance when cleaning it, a half drop or swing door on hinges, attached to the upper part to keep out beating storms and cold, and a tight board fence, high and strong, which will prevent teasing the sows, and will also prevent fretting and irritating the boar. This often has disastrous results, the boar becoming impotent by self-abuse, especially in the case of young sires. There should also be a feeding floor in one corner of the yard, eight by eight or ten feet, so that a large boar can stand in front of the trough—a V-shaped trough of three feet in length, securely fastened to floor and wall. A plank should be securely fastened edgewise with spikes to end slippers, and stakes firmly driven home to guard against his natural propensity of root hog. At the corner a slide gate two and one-half by three feet should be placed, to permit the entrance of sows. At the further end of the floor build the pen. This may seem like extravagance, but when we take into consideration that a yard of this kind will last from fifteen to twenty years by simply reposting it, this will lose its force, and furthermore to have a boar under control and use him at will is worth a great deal. If the yard can be situated so as to give natural drainage it is an advantage, but it is essential that a hand rake, shovel and fork should frequently be used to prevent contamination. But while secure and under control, the boar should never suffer for a food ration calculated in its nature to develop him; he should not suffer for the want of green food and succulent food when the season permits, and in fall and winter squash, pumpkins and roots should not be wanting. Nor should he be deprived of charcoal, ashes and salt—in fact, no hog should.

KEEP THE GOOD BREEDERS.

If it is of importance to retain the boar to a greater age and until further development, it is of equal importance in the case of the sow. Too many do not deem it essential that they should have a system of breeding; if not, why not? Why can we not have a note book, a list and a record of the sows that have proven themselves superior in all respects? Why not retain her as long as she proves satisfactory, instead of using a young, untried one that has not been selected with regard to heredity and the virtues of a mother; a breeder, and her milking qualities, but because she is pretty and she is a sow? If sows are selected yearly to replace those weeded out—those that have proved unsatisfactory—they should be selected from only the best and most profitable mothers, so that improvement will keep pace with reproduction. This selection should be deferred until the pigs are from three to four months of age, as we can then better judge their development and disposition, and they

should be fed on the very best growing and developing food available. We have found it a good practice not to breed the sow for a second litter the first season, but to give her a chance to recover from the strain so as to fully develop in size and vigor. Thereafter we breed her twice a year. We have an inflexible rule that no young sow is bred before she is eight months of age. It will also be found of practical advantage when having a list of sows in a note book either with name, mark or number; or for convenience put a ring in the right or left ear, the upper or under side, to note the time they come in heat, say in October; any farmer knows that this will occur each three weeks. In this way he will not waste time in watching when to breed the sows or be disappointed in missing her, but one who never practiced it will find to his astonishment that he is becoming master of the situation.

UNIFORM HERDS.

With the boar in the enclosure, able to regulate the service, and knowing that the gestation period takes place within 110 to 112 days, he will know that by March or April 1, as the case may be, he must be ready to accommodate ten or twelve sows with breeding pens and play midwife day and night. As a compensation for labor and system he has a lot of pigs of nearly the same age and size to feed and care for, a uniform lot to put upon the market, not to mention the advantage of being weaned at one and the same time. This is not a fine-spun theory, but has been the practice of the writer for a long series of years. The sows can then be turned out to pasture and receive a liberal allowance of feed once or twice a day, at stated time, according to their condition. In order to have them fully recover from the strain of nursing and breeding. All that have proved deficient are weeded out for fattening, and young sows are put in their place as heretofore stated. But sows having their first litter should not be condemned for having a litter of but five pigs if they are otherwise satisfactory and are uniform breeders. A twelve or fourteen teated sow, of roomy build, generally responds with sufficient numbers at her second litter, unless heredity on her dam's side is wanting in this quality. But should there be small and uneven litters with the larger number of sows the sire may be at fault.

FEEDING THE BROOD SOW.

[From the Prairie Farmer.]

Did any of our readers ever investigate the growth of a litter of pigs and learn by experience what an organized appetite the little fellows are? A Wisconsin experiment, made some years ago, showed that a litter of seven pigs, weighing eighteen pounds when farrowed, had, at

the end of the third week, increased to ninety-eight pounds, or about five and a half times. To make such an increase the pigs must have consumed a good deal of food, and it all came in the form of milk from the dam. The fact is stated to convey an idea of the importance of feeding the brood sow liberally during the nursing period, for she must not only sustain herself but must provide for this rapid growth of the young. The liberal feeding, however, should be judiciously planned with a view to other conditions of the problem. Having tapered the feed down until it is quite light as farrowing time is reached, the sow needs nothing but cool, though not chilly cold water for the first twenty-four hours. Then the feeding should begin light, and full feed should be gradually reached only at the end of about ten days. An observance of this plan is necessary to prevent those digestive disturbances in both dam and litter which carry off so many young pigs, making them wonder, if they can be supposed to wonder,

If so soon I am done for,
What in the world was I begun for?

The large losses that occur in litters on the average, especially among very young pigs, are in a great measure due to injudicious feeding either in quantity or kind, and it is generally overfeeding that does the mischief. The kind of food given, too, is important. The sow has to make an abundance of wholesome milk of a quality that will produce gains of the kind indicated, and these gains are growth rather than fat. The feed given to the dam must, therefore, be growth making food. This means that it should consist of bran, shorts, oat meal and feed stuffs of that class rather than of the heat and fat making kind, like corn. There is, it is generally admitted, too much corn fed to hogs in the corn belt at best, but there is no period at which the feeding of it is a greater mistake than during the suckling period. After the sow has lain quiet and undisturbed for twenty-four hours a thin bran slop should be given, and this may be gradually thickened, at first with bran, and later with bran and shorts, until after ten days good, liberal feeding is reached, consisting chiefly of the more nitrogenous kind. If methods of which what has been said is only an outline are adopted, and if, in addition, care is taken to guard the pigs against exposure and overlying, there will be a good deal larger percentage of pigs raised than is usually the case. The question of exposure is an important one, especially with litters that come during the changeable weather of early spring, and unless the swine grower is prepared to give adequate protection, it will be well not to breed for early litters at all.

HOG CHOLERA CURES.

So many "infallible" hog cholera cures have been put upon the market the past decade that swine breeders have very little faith in any new remedy that is suggested. Dr. C. D. Smead makes some very timely suggestions on this subject, and is of the opinion that the disinfecting of the pens or premises, the separating of the diseased from the healthy, and the practicing of better sanitation have done more toward effecting a cure than the remedies used. He says: In fact I do not believe that swine plague (hog cholera) can be eradicated from any herd, without a change in sanitary conditions in most places where it appears, the practicing of a vigorous quarantine and the free use of germ-destroying elements in the form of disinfectants. I also believe that it may be possible for healthy swine to be so medicated that they can be for a time kept with ailing swine and not contract the disease, and yet the medicine that was used would not be able to cure a hog that had the disease. I am glad that some discoveries have been made on the line of treating the disease, and not altogether by scientific research, but by men who are not professional scientists. Men of common sense have done and are doing as much toward finding a cure as the college professor, and while I do not think that a "sure pop" each and every time cure has as yet been discovered by any one I do think that the fellow who is on the farm among the swine, and has been practicing common sense as regards sanitary conditions and the use of such drugs as his judgment dictates him to use, is in advance of the fellow who is searching for bacteria through a microscope, and cultivating serums that he hopes will be able to render well animals immune from the disease if hypodermically injected into the system.

While thousands of dollars have been expended by commissions and by experiment stations in striving to find a cure, the result has thus far been in one sense a failure, and in another sense a success. Scientific research has found the cause to be a bacterial germ having its origin in filth, and has also found that the disease can be and has been carried from farm to farm upon the boots and clothing of people who thoughtlessly visit sick herds of swine, and then visit their own or some other fellow's herd. The lesson therefore taught is to clean up all filth and make and keep the sanitary conditions right and the food wholesome, and then keep away from diseased animals, and keep diseased animals away from healthy ones; or, if compelled to care for sick ones or help a neighbor to do so, change your boots and outer clothing before attending to other swine. It has also been discovered by scientific research that there are many germicides and disinfectants that can be safely used, viz., carbolic acid solutions, solutions of sulphate of copper, and the sulphate of iron, also slaked lime. It has also been learned that several drugs can be safely given internally to all swine when the disease is prevalent that will to some extent prevent their contracting the disease, provided

ordinary sanitary conditions are present. One of the simplest and safest that can be used by farmers is the hyposulphite of soda (so often recommended in these columns). This has long been known to have the power of destroying ferments in the blood of either man or beast, and as far as my experience goes will do as much toward rendering a pig immune from the disease as any known compound. As to the advertised specifics that are being put upon the market as sure cures they may be good. Many of them undoubtedly are, but don't invest too heavily or place too much faith in them until you are sure. But remember all the time that filthy conditions must be eradicated and good sanitation provided, or my word for it the sure cure won't cure. Farmers as a rule place too much confidence in specifics or cures for ailments of their animals, and take no heed concerning the food, water and sanitary condition of their stables and feed lots. There is work on this line for the farmer himself that no professional man or specific drugs can ever do. Especially is this the case with epidemic or infectious disease. Any building that can not be made clean and kept clean is not fit to keep a well animal in, much less a sick one. And any feed lot that can not be kept free from filth should be changed to another one. Any well, spring or stream that does not furnish water fit for man to drink should be condemned as a watering place for animals (especially milch cows). When farmers learn these things and put them in practice, then and not till then will hog cholera and many other diseases be stamped out.

In saying what I do about water I do not wish to be understood as saying that the water that man relishes the best is the ideal water for the beast. Mankind as a rule like water at a temperature of about fifty degrees, while most animals like it from ten to twenty degrees warmer. But I have reference to its purity. The old well that gets the soakage from the manure pile, or the stream that collects filth, or the spring that gets to be but a cesspool from the droppings of animals who go there to drink, these are the places that need looking after and the conditions made right. In most cases the well can be made right with but little expense by cleaning or even digging a new one. Fence off the stream or spring so as to prevent the bad conditions. You can do very much for yourselves along the line of preventing disease on your farms of all your animals, if you only will. In fact, far more than professional men with drugs ever can do for you; and while you are about it don't forget that the house well needs cleaning occasionally, and the cleaning of the privy vault and opening up the sewer drains and the free use of carbolic acid in water solution. Sulphate of iron and lime applied to the place where slops are emptied about the house, not forgetting the sink, may save you many a case of typhoid fever and diphtheria in the family. All along the line, either in the dwelling or about the barns and stables, disease germs in the filth that is allowed to accumulate, and you suffer in consequence, while we doctors and patent medicine venders are reaping a harvest.

HOW TO CARE FOR BROOD SOWS.

BY D. J. GREEN, NOBLE COUNTY, OHIO.

The care of the brood sow has a great deal to do with the success that we may expect to have with the coming litter.

In the first place I should want good sows to care for. I have no time or feed to waste on such sows as I see on many farms.

If there are any in your herd that after a fair trial have not given satisfaction as breeders dispose of them, and if your business demands that others be added be very careful in their selection. But I think it is a common mistake with many of us that we try to keep too many sows, and do not give them the care that we could give to a less number. consequently do not raise as many nor as good pigs as we might from a less number.

In selecting young sows I should want to know something about their ancestors, at least as far back as their grandams and sires, for in hogs there is as much difference in different family strains as in any other kind of animals. I have noticed that young sows partake largely of the characteristics of their dams, especially in regard to disposition and prolificacy. So I should select those that were out of sows of good form, good disposition and prolific breeders.

PROLIFIC SOWS.

By prolific breeders I would not restrict them to those that produced twelve to eighteen pigs at a litter. A sow that produces eight to ten good, strong, even pigs is prolific enough for me. Those that have so many seldom raise more than half of them, and it stands to reason that a sow that has a reasonable number will have larger and stronger pigs, and such are more likely to survive. I think that the sow and not the sire is responsible for the number in litters.

I think that the condition of the sow at the time she is bred has much to do with the number of pigs conceived. She should not be too fat nor too lean, but she should be in a plump, healthy condition, if you would expect her to do her best and maintain the reputation of her particular family strain. To produce this condition she should have plenty of exercise and good, nourishing feed, of which grass or other green feed should form a considerable part.

Now we have our sows selected and ready for breeding. The next thing is, To what kind of a boar shall we breed them? After selecting sows of the breed and type typical of our ideal hog, I should select a boar as near like them as possible, but not near akin. I think that sows bred

to boars of their own type will produce pigs of more uniformity, which will add much to the attractiveness as well as profit of the herd.

After sows are bred they should be separated from other hogs, and I should prefer not more than two or three together, and they should be agreeably mated. Don't put a young, timid sow with an old, cross one if you expect good results, but put the old ones by themselves and the young ones together. Then you may at least hope for peace and harmony.

THE SOWS' QUARTERS.

The brood sows should have good, comfortable quarters. Their sleeping room should be tight and dry, and well protected from draughts. If the door is to be left open there should be a wind-break. This can be made by driving stakes in the ground and nailing boards on them, making a passage way to the door.

The bedding should be watched closely. The straw or other material used for bedding should be strictly dry, and as soon as it becomes mussed and shows signs of being damp it should all be removed and good, fresh bedding supplied. Bedding will require more attention in muddy weather than when the ground is frozen or dry. I lay a good deal of stress on bedding in the winter. I have seen so many hogs with patchy coats in the spring, large portions of the body almost destitute of hair. I never have had such when I was careful about the bedding, and I am inclined to think that damp, filthy bedding causes it.

PLENTY OF EXERCISE.

Brood sows should have plenty of exercise. They never do so well with me when confined in a small lot. I would prefer that they have the range of a large pasture field at least during fair days. They are fond of the grass and will take lots of exercise to get it, and both are good for them. I frequently let a number of them run together on a pasture after the cattle or on rye pasture, and give them separate quarters at night. They soon learn their places and will be on hands at night, and by letting the hogs in first we have but little trouble in separating them.

Brood sows should be fed a considerable variety of feed. I always feed some corn to all my hogs. I believe it is a natural feed for the hog, but brood sows should have in connection with it bran slop, roots and other green feed such as rye and grass as I have mentioned, and in long-continued, severe winter weather, when they can not get the grass they relish, early cut clover hay, I think, is of great benefit to them. They should be fed liberally, but not sufficient to produce too much flesh, and just here I would emphasize the importance of exercise. I believe that every pregnant animal is benefited by a reasonable amount of exercise. I know a man who keeps his mares in fine condition and in the winter

he keeps them confined in the stable, and in bad weather carries their water to them. The result is that he has lost more colts at foaling time than any man I know, and I believe it is from the lack of exercise.

FARROWING TIME.

This period should be looked forward to with consideration. After we have labored to have the sow produce a good, strong litter of pigs we should see that it is not our fault that she does not save all of them. Several days before farrowing time she should have separate sleeping quarters from all other hogs, and this should be the place that you expect her to occupy at farrowing time, and everything should be in readiness. The nest should be tight so that the pigs can not crawl out and away from the sow and perish, as they will frequently do if an opportunity is afforded them. It is a good plan to place a fender around the nest to prevent the sow from catching the pigs between her and the wall. I find that smooth, round poles are about the best material for this purpose. Place them about ten inches from both floor and wall, and be sure to fasten them securely or the sow will be very likely to tear them loose. She should be furnished a good supply of bedding, and for this purpose I know of nothing better than dry forest leaves. All this, as we have said, should be done several days before the sow is due to farrow, so that she will be accustomed to her quarters, and will not fret to get out at the time that she should be quiet.

She should be handled and made familiar with your presence, so that it will not disturb her for you to enter her quarters if need be at the time of farrowing. She should be entirely rid of lice before farrowing, for it is easier to clean one animal than eight or ten, and little pigs will do no good with lice on them. Carbolic acid in grease and lamp oil is the best thing I have found to destroy hog lice. After farrowing the sow should be fed lightly for several days, a little bran slop with plenty of drink at first, gradually increasing her rations until she is on full feed.

Some may say that all of this care is too much trouble, but I have found that good management is more to be depended on for success than good luck.

VALUE OF SUCCULENT FOOD FOR SWINE.

BY C. S. PLUMB, PURDUE UNIVERSITY.

In the consideration of this subject it is desired to draw attention to the different succulent foods available for feeding swine and to note their several influences on animal growth. The writer will not only give the results of his own experiments in feeding succulent foods to swine,

but will quote freely from the published statements of others, trusting that there may be information in the facts presented which will be of service to our feeders and breeders.

Succulent foods for swine may perhaps be placed in three distinct groups, as based on the character of the plants supplying the same: (1) Grasses, cereals and clovers. (2) Fleshy or thick-leaved plants. (3) Roots and vegetable fruits.

Blue grass is the commonest pasture grass in those States most given to swine raising and so perhaps first merits attention. During 1888, '89 and '90, Professor Morrow at the Illinois Station studied the feeding value of blue grass for pigs. ("Bulletin 16," Illinois Experiment Station, May, 1891.) Four trials were made. One lot was fed corn only, one a full feed of corn and grass and the third a part feed of corn and grass. The pigs receiving a half-feed of corn and pasture during the first period of eight weeks (which was then followed with four weeks of full corn feed with pigs still in pasture) gave the best results. Thus 441 pounds of corn produced 100 pounds of gain. When pigs were fed full grain on pasture it required 507 pounds of corn to make 100 pounds of gain in weight of pig. The pigs confined in yards free of vegetation required 629 pounds of corn for 100 pounds of gain. Professor Morrow reports that he did not succeed in getting pigs to make fair gains on pasture alone, and Henry states ("Feeds and Feeding," 1898, page 579) that his experience coincides with Morrow's in this respect. Writers on the summer feeding of swine usually commend blue grass for pasture, but it is not so highly regarded for swine as some other succulent foods.

When at the Utah Station Sanborn experimented with four lots, of three pigs each, from May 25 to October 14. ("Bulletin 22," Utah Experiment Station, May, 1893.) Lot 1 had pasturage; Lot 2 was confined to a yard 6x8 rods, in which the pigs were fed cut grass, while Lots 3 and 4 were confined in pens 8x16 feet, one lot receiving grass and the other not. The four lots had all the grain they would eat, a mixture of ground wheat, ground barley and bran. The grass was a mixture of eight varieties, of which alfalfa was the principal one. The results of this experiment were such as to cause Sanborn to write: "The figures show no pronounced advantage in favor of grass feeding to pigs * * * To make grazing successful it will have to occur with a limited amount of grain." Later Mills carried on similar trials at the Utah Station ("Bulletin 40," December, 1895), in which like results were secured. In experiments where pigs were fed grass only and no grain they lost in weight during the trial.

At the Ontario Agricultural College Professor Shaw conducted an experiment ("Bulletin 59," Ontario Agricultural College) on nine pigs, divided into three lots of three each. They were fed from June 7 to October 8, 1890, as follows: Lot 1, all they would eat of a grain mixture of two parts by weight of ground peas and one part each of ground

barley, ground oats and wheat middlings. Lot 2 was fed three-fourths as much grain as Lot 1 and a quantity of cut green fodder, "consisting of clover, oats and vetch, corn and millet, as these came in season." Lot 3 had one-third as much grain as Lot 1 and twice as much green food as Lot 2. At the close of the experiment Lot 1 was fat, Lot 2 was prime and Lot 3 was not improved in condition. Shaw concludes that a grain ration is best in every way.

Rye is generally recommended for late fall or early spring pasturage for pigs, and the writer has used it for this purpose when no other suitable green food was available. There is no specific data, however, that I know of which shows the feeding value of green rye for pigs. It may be fed to advantage before the stalks appear and later when the head is in the milk or dough, though brood sows in pig should not be permitted on such pasturage, owing to the danger of abortion being caused by ergot in the rye.

Common red clover is the most generally-used pasturage for swine by western farmers, and other green crops are used in a small way compared with this. Notwithstanding this fact, we have almost no figures available showing the value of this pasture. In his work on "Feeds and Feeding" Henry gives only an example of using clover hay with meal as food for pigs. Stewart, in his work on "Feeding Animals," reports on an experiment in which green clover was cut and weighed out to pigs. A litter of six pigs was weaned at five weeks old and divided into two lots of three each and of equal weight. Each lot was placed in a separate pen on June 1. Lot 1 was fed corn meal soaked twelve hours in cold water as much as the pigs would eat, while Lot 2 had a small portion of chopped green clover mixed with the corn meal. Stewart notes that the pigs fed clover and meal were always lively and always ready for their feed, while Lot 1, with meal alone, ate greedily for a time, then became mincing and dainty for a few days, indicating a feverish condition of the stomach. By fasting they appeared to recover appetite and go on eating vigorously again. This was repeated many times during the five months the experiment continued. Each lot consumed the same amount of meal. At the end of this time, the one fed on meal alone averaged 150 pounds each; those fed clover and meal 210 pounds each, or 40 per cent. more for being treated according to their nature as grass-eating animals.

Stewart recommends the soiling process with pigs ("Feeding Animals," 1886, page 469) and claims that an acre of good clover will soil four times as many pigs as it will pasture, giving them a full ration of grass, with this great advantage over pasture—that you may mingle the grain ration with it so as to produce the most rapid growth with perfect health.

At the New York State Station six Chester White pigs were divided into two lots of three each, and one fed oat and pea forage and one fresh second-crop red clover. This trial, however, covered but three weeks, in which time the oat and pea lot gained the most, consuming 7.37 pounds

dry matter for a pound of gain, while the clover lot ate 31.89 pounds per pound of gain.

An interesting comparison of the feeding value of green clover is given by Coburn. ("Swine Husbandry," 1877, page 111.) This is shown best in the following table :

	Gross Product per Acre.	Will Produce in Pork per Acre.	At Four Cents per Pound Will Be Worth.
Wheat	900 lbs. (15 bu.)	225 lbs.	\$9 00
Barley	1,680 lbs. (35 bu.)	420 lbs.	16 80
Oats	1,320 lbs. (40 bu.)	320 lbs.	13 20
Corn	2,240 lbs. (40 bu.)	560 lbs.	22 40
Pear	1,500 lbs. (25 bu.)	375 lbs.	15 00
Green clover	12,000 lbs. (6 tons)	800 lbs.	32 00

This table is on the basis that four pounds of the raw material will make one pound of pork, except that of clover, for which fifteen pounds is allowed for a pound of pork. As relates to corn and wheat, in my experience, these figures are perfectly reasonable. The claims for clover, however, are, I think, somewhat excessive. Coburn says:

"If this is true in practice it is evident that an acre of clover is worth for pork making as much as three and one-half acres of average wheat, almost as much as one and one-half acres of good corn, and nearly as much as two and one-half acres of good oats."

Sullivant, in the Ohio Agricultural Report, figured that an acre of timothy and clover, green, weighed 12,000 pounds, that $7\frac{1}{2}$ pounds of grass and clover will be consumed daily by one pig from May to October, or during 153 days, which is equivalent to 1,146 $\frac{1}{2}$ pounds for one pig, which indicates that the acre of ground will support ten pigs, and that 382 $\frac{1}{2}$ pounds of pork can be made from the acre of timothy and clover.

Alfalfa is probably one of the best green pasture crops for pigs, and in experiments at Utah, where this plant formed about one-half the basis of the green grass, pigs did very well when fed grain in addition to the pasture. Alfalfa, however, will not grow satisfactorily in the East as a rule, and consequently red clover in the Central West must be regarded as its superior under ordinary conditions.

Rape at the present time is the most favorably known of the fleshy-leaved plants for swine pasture, and while but a comparatively small number of trials have been reported showing the value of rape for this purpose, these have attracted sufficient attention to justify further trial.

At the Indiana Station for three weeks, during the summer of 1898,

we fed rape to pigs. Eighteen Chester White pigs were selected, weighing from 60 to 120 pounds, on July 5. These were divided into two lots of nine each, five sows and four barrows being in each group. Each lot was kept confined in a small lot free of vegetation. Lot 1 was fed such fresh cut rape as it would eat, in addition to a mixture of half corn meal and half shorts, with some skim milk to drink daily. Lot 2 received the same kind of feed, less the rape. During the three weeks Lot 1 gained $164\frac{1}{2}$ pounds in weight, or an average of .86 pounds per day per pig, while Lot 2, which received no rape, gained 223.5 pounds in 21 days, or an average of 1.18 pounds per day per pig. During this trial Lot 1 ate $274\frac{1}{2}$ pounds of corn meal, $274\frac{1}{2}$ pounds of shorts, $280\frac{3}{4}$ pounds of skim milk and 395 pounds of rape, while Lot 2 ate $366\frac{1}{2}$ pounds each of corn meal and shorts and 276 pounds of skim milk. If now we figure the corn meal at 80 cents per 100, shorts at 60 cents, skim milk at 15 cents and rape at 5 cents per 100 pounds each, we find that each pound of flesh in Lot 1 cost 2.65 cents and in Lot 2 2.47 cents. While these figures show that the cost of production in each case was an economical one, the balance is in favor of the pigs that received no rape.

At the Wisconsin Station two trials of feeding rape to swine have been reported, ("Bulletin 58," Wisconsin Experiment Station, April, 1897), including in all fifty-eight hogs. In both these experiments one lot of pigs was penned and fed soaked corn and also shorts in a slop, consisting of two parts corn and one part shorts by weight. The other lot had the same grain feed with a limited amount of rape in addition. In the first trial the ten hogs on rape ate, in seventy-six days, 1,386 pounds of corn, 690 pounds of shorts and .32 acre of rape, and gained 853 pounds. The other lot, penned, ate 2,096 pounds of corn, 1,042 pounds of shorts and gained 857 pounds. As the gain is essentially the same in each lot, the third of an acre of rape saved 1,062 pounds of grain, or an acre of rape would be worth 3,318 pounds of grain. In another trial of two lots of nineteen each, conducted in the same manner and fed the same rations for forty-nine days, the rape lot ate 2,220.3 pounds of corn, 1,109 pounds of shorts, .6 acre rape and gained 1,066 pounds. The penned lot ate 3,106.5 pounds of corn, 1,553 pounds of shorts and gained 1,076 pounds. The gain is practically the same in this instance also, so that it may be said that the .6 acre of rape saved 886.2 pounds of corn and 444 pounds of shorts, or that one acre of rape is worth 2,217 pounds of grain. The average of the two trials indicates that an acre of rape is worth 2,767 pounds of such grain for fattening hogs.

Prickly comfrey, another plant with rather large, succulent leaves, has been experimented with some as a green food for swine, but not with success. At the New York State Experiment Station two lots of swine were fed ("Bulletin 28," N. S. New York State Experiment Station, 1891), there being three pigs in each lot. The pigs of both lots were fed "all the prickly comfrey they would eat, and a little corn meal. The comfrey

formed over 90 per cent. of the total food consumed in both pens." There was a steady loss in weight while comfrey was fed.

Sanders Spencer, the noted English swine authority, says ("Pigs: Breeds and Management," 1897, page 66):

"Our own experience and that of many other pig keepers is not in favor of the use of prickly comfrey. The pigs are not particularly fond of it, and unless a considerable addition of good food is made they will grow big in the belly and narrow on the back, losing all muscle."

Purslane or pusley, a very succulent common weed, has not been generally used for feed, but it possesses some merits. In 1898, at the Indiana Station, for twenty-one days, purslane was fed two Chester White sows. The pigs were of about the same size and age and the purslane was well developed when fed. From September 21 to October 11 the sows were confined in a small yard or pen. They were fed a mixture of half shorts and half hominy meal, twice a day as a slop, and all the purslane they would eat. During this time the pigs consumed $61\frac{1}{2}$ pounds each of hominy feed and shorts, and 390 pounds of purslane. One pig weighed 162 pounds on September 20 and $182\frac{1}{2}$ pounds on October 11, a gain of $20\frac{1}{2}$ pounds, and the other weighed 157 pounds on September 20, and 174 pounds on October 11, a gain of 17 pounds. Rating hominy feed at 65 cents per one hundredweight and shorts at 70 cents per one hundredweight, this gain in weight would cost 2.2 cents per pound. The pigs consumed about $18\frac{1}{2}$ pounds of purslane per day between them. It was not eaten with the relish that was to be expected, yet the pigs did very well while receiving it, making fair daily gains.

Roots and vegetable fruits furnish a class of succulent foods for swine that may be regarded as a most desirable sort for winter feeding when pasture is not available. Some of these may be grown at comparatively small expense.

Artichokes for many years have been known as suitable for pigs, and the live stock and agricultural press have published much relative to the value of this plant for swine. The writer's experience with artichokes has not been so encouraging as reported by others, but perhaps this is due to a somewhat limited experience. Four sows placed in a small field of artichokes that had not been disturbed made a total gain in weight between October 25 and November 8 of twenty-seven pounds. They rooted out the artichokes and were fed in addition fifty-seven and one-half pounds each of corn meal and shorts. Each pig gained much the same in weight. These pigs no doubt would have done better had there been a larger area of artichokes to feed on, so that the experiment might have been longer continued. As it was they practically cleaned the lot of all tubers.

Some very flattering reports have been made on artichokes. Coburn quotes A. C. Williams ("Swine Husbandry," 1877, page 112), a prominent

and successful Poland-China breeder in Iowa of years ago on a large scale, as writing:

"The keep of my hogs in warm weather is blue grass, clover and Brazilian artichokes. Forty head of hogs and their pigs may be kept without other food on an acre of artichokes, from the time frost is out of the ground until the first of June, and from September or October until the ground is again frozen."

At the Oregon Experiment Station six Berkshire pigs weighing from 113 to 215 pounds each were fed artichokes and grain from October 22 to December 11. They gained 244 pounds in weight, or an average daily gain of 0.81 pounds. The pigs ate 756 pounds of grain during this period, which is 3.1 pounds of grain for each pound of gain in live weight. In other experiments it was found that it required five pounds of mixed grain to produce a pound of gain, hence on this basis the artichokes consumed would represent two pounds of grain in producing each pound of gain in live weight. The pigs consumed the artichokes on one-eighth of an acre, rooting them all out. ("Bulletin 54," Oregon Experiment Station, 1898.)

Sweltzer, of the Missouri Station, reports a trial by Porter in which artichokes and wheat meal were fed pigs. It required 325 pounds of wheat meal and 820 pounds of artichokes to produce 100 pounds of increase. ("Bulletin 29," Missouri Experiment Station.) In none of the reports on feeding artichokes are results secured in gain of live weight that have not repeatedly been attained by feeding no larger amount of grain than is indicated in these trials where no artichokes were used.

Potatoes, as has already been stated, have long been used as food for pigs and usually in the boiled form. Pigs will eat raw potatoes, but not with the relish that they will boiled ones. Henry reports ("Feeds and Feeding," 1898, page 595) three experiments in which a comparative test is made of cooked potatoes and grain when both were fed in connection with skim milk or whey. Four pounds of potatoes fed against one pound of grain gave practically the same gain in live weight. The quality of the pork from the potato feeding was good.

At the Oregon Station ten pigs were divided into two lots. Lot 1 was fed one part shorts and two parts chopped oats, while Lot 2 was fed a mixture of shorts and cooked potatoes. The pigs in Lot 1 consumed 6.8 pounds each per day, and made a daily gain of 1.8 pounds, or one pound of gain to 3.8 pounds of food. The cost of producing 100 pounds of live weight in this lot was \$2.18. The pigs in Lot 2 consumed 12.4 pounds of potatoes, and 2.8 pounds of shorts each per day, and gained 1.3 pounds per day. The cost of 100 pounds of gain with Lot 2 was \$2.86. From this experiment, when the potatoes were reckoned at ten cents per bushel, there was no profit in feeding them. An effort was made to increase the amount of potatoes consumed, but the pigs would not eat the greater quantity.

Sugar beets, through the recent great increase in their cultivation for sugar production, are attracting attention as a food for swine. Last year at the annual meeting of the Illinois Stock Breeders' Association strong testimony was given by practical feeders in favor of feeding them to pigs. The testimony seemed to be that the pigs relished them and improved while receiving them in their rations.

In experiments at the New York State Station ("Report for 1892," page 283), in which sugar beets were compared with sorghum as food for swine, about $5\frac{1}{2}$ pounds of beets and $6\frac{1}{2}$ pounds of sorghum per head were fed daily as a full ration with skim milk and linseed meal, with the result that "all the rations gave profitable results." This trial covered sixteen weeks.

At the Canadian experimental farm at Ottawa, two lots of eight pigs, averaging about 60 pounds in weight per pig, were fed from December 29 to May 18 a mixture of ground peas, barley and rye, with sugar beets and silage respectively. ("Report of the Central Experimental Farm, 1891," pages 83 to 87.) To half of each lot grain was fed steamed; to half, raw. The pea silage was made from peas harvested when the pods were full, but the peas soft and the vines green and succulent. The silage kept well but the pigs refused to eat much of it. The results show no striking differences between gains on pea silage and on sugar beet rations.

Mangel wurzels furnish the farmer with a large amount of succulent winter food in the form of roots. These may be produced very cheaply. In 1898 at the Indiana Station we grew as high as $25\frac{1}{4}$ tons of mangels per acre at a total cost of only eighty-five cents per ton harvested. No other succulent winter food for swine can be produced so cheaply; consequently, if they can be profitably fed the growing of mangels should be encouraged. Beginning on February 1, 1899, a feeding experiment on pigs fed mangels was begun at the Indiana Station. Twelve Chester White pigs were selected, which were about three months old, at the beginning of the experiment. The pigs were divided into two lots of six each. Each lot was confined in a pen about 15x30 feet, with a comfortable shelter house in one end. Each lot was fed a grain mixture of one part corn meal and two parts shorts, and Lot 1 was fed cut mangels and Lot 2 was not. Lot 1 ate, up to April 19, $442\frac{3}{4}$ pounds of corn meal, while Lot 2 ate $551\frac{3}{4}$ pounds, or 109 pounds more than Lot 1. Lot 1 ate $877\frac{1}{2}$ pounds of shorts, while Lot 2 ate 1,091 pounds, or $213\frac{1}{2}$ pounds more. Lot 1 also ate 514 pounds of mangels, which was about as much as they could be induced to consume.

The following table shows the more important facts relative to this experiment, which is a comparison of the cost of food to cost of grain:

	Lot 1.	Lot 2
Total pounds gain made.....	355.5	442.5
Average daily gain made in pounds.....	4.6	5.7
Pounds of meal and shorts to make pound gain.....	3.71	3.71
Cost of food fed.....	\$10 19	\$12 05
Cost of food for each pound of gain.....	028	027
Cost of food for each 100 pounds of gain.....	2 80	2 70

The interesting facts are brought out by these figures that it required exactly the same amount of corn meal and shorts to make a pound of gain with each lot, and the total cost of food for each pound of gain for Lot 1 was slightly in excess of the cost for Lot 2, the roots making this extra expense, which amounted to ten cents for each 100 pounds of gain live weight.

A study of the amount of digestible food consumed by these pigs shows that Lot 1 was fed 3.36 pounds dry matter for each pound of gain, and Lot 2 was fed 3.23 pounds of dry matter for each pound of gain.

In his work on "Feeds and Feeding" Henry quotes at considerable length certain Danish feeding experiments on pigs. In reference to the use of roots I wish to quote from some of the statements made. In comparing mangels and grain, all the lots received skim milk or whey in addition to grain and roots, excepting Lots E and F, to which an equivalent of additional roots was given. It is here shown that ten pounds of mangels more than equal, and eight pounds about equal, one pound of grain in trials. The quality of the pork produced by the different lots was very satisfactory. Even where one-fourth the daily feed was given in the form of mangels no ill effect was noted.

In 1890 a preliminary feeding experiment was made, using beets with different sugar contents, to ascertain their comparative feeding values. Mangels containing 12.71 per cent. dry matter and 8.93 per cent. sugar were fed against fodder beets containing 19.86 per cent. of dry matter and 13.8 per cent. of sugar, or against barley. The experiment included twenty-five pigs, averaging 79 pounds each and lasted seventy days. The indications were for pigs one pound of barley had a feeding value equal to 6 to 8 pounds of mangels or 4 to 8 pounds of fodder beets. In 1891-92 204 pigs were fed four kinds of roots, in addition to daily refuse and grain. There were fed—

	Dry matter.	Sugar.
(1) Eckendorf mangels containing.....	11.0 per cent.	6.0 per cent.
(2) Elvetham mangels containing.....	13.0 per cent.	8.9 per cent.
(3) Fodder sugar beets containing.....	16.5 per cent.	10.9 per cent.
(4) Sugar beets containing.....	21.2 per cent.	14.0 per cent.

Lots fed barley only made the largest gain, closely followed by those half of the grain of which was replaced by roots in the following ration:

For one pound barley substituted 7.5 pounds Eckendorf mangels, 6.5 pounds Elvetham mangels, 5 pounds fodder beets and 4 pounds sugar beets. These quantities of different kinds of roots proved nearly equivalent in feeding value. The conclusion was arrived at that about 40 per cent. of the daily ration of the pig may be advantageously made up of roots. Slaughter showed pork from pigs fed roots fully equal to those fed grain only. Long states ("Book of the Pig," 1886, page 254) that he remembers one case where a large quantity of mangels returned \$6.24 a ton when fed to pigs. At the New York State Station they made a return of \$3 per ton. ("Bulletin 28," New York State Station.)

Carrots are not a profitable crop to grow for feeding live stock, owing to the expenses of cultivating and harvesting. Long states that they have long been used for pigs, although they are too rich for feeding animals. ("Book of the Pig," 1886, page 254.) Numerous experiments, according to this author, have been made in feeding them, and it has been shown in some instances that they have returned as much as \$7.20 a ton by being converted into pork.

In the Danish feeding experiments above referred to in 1892-94, on nine different estates, 893 pigs were divided into 175 lots. In comparative trials carrots and mangels containing equal quantities of dry matter had similar value in pig feeding. It was shown that the amount of dry matter in roots is of importance, rather than the total weight or quantity of sugar contained.

Later nine experiments with 277 animals in 54 lots were conducted for the study of relative values of barley, mangels and carrots. Two kinds of mangels and four kinds of carrots were used. Dairy refuse was fed all the lots. Roots were fed in such quantities that 0.84 pounds of dry matter in roots corresponded to one pound of grain. The experiments lasted 80 to 130 days, the average being 102 days. The pigs averaged 66 pounds at the beginning of the experiment and 169.6 at the end. The average daily gain made by the lots on different rations was as follows:

Barley	0.986 lb.
Eckendorf mangel wurzels.....	0.828 lb.
Elvetham mangel wurzels.....	0.833 lb.
Vogeser and Champion carrots.....	0.875 lb.
James and Giant	0.900 lb.

The gains made on roots in these experiments are not up to the previous ones. Carrots are shown to be of similar feeding value for pigs as mangels when equal amounts of dry matter are fed.

Kohl rabi is practically unknown as a pig food in America, I believe, but in England Sanders Spencer uses it to a considerable extent. The following quotation is of more than common interest, not only in relation to the food used, but method of handling the pigs. ("Pigs: Breeds and Management," 1897, page 64):

"It is scarcely necessary to remind our readers that a somewhat different system of feeding the sows is advisable in the winter to that which is suitable in the summer, when there is plenty of grass. * * * At the time of writing (December) we have some sixty aged sows, the majority of which are carrying their pigs. * * * These are being kept in three lots, one of which comprises thirty-six of the strongest and most lusty of the sows; these have the run of some fifteen acres of grass, and besides what they can find on the grass field they have nothing but kohl rabi and an occasional feed of small or diseased potatoes. As those of the sows which are forward in pig require more nutritious food they will be drafted out and supplied with it. Another lot of nine sows, which have each reared one good, large litter of pigs and are again forward in pig, have the run of a grass field of some five acres in extent, in which is an open shed which is used by the sows for shelter. Their food consists of kohl rabi and some mixed meal, of barley, wheat, maize and peas, fed to them as slop, night and morning. Other sows that are older are fed kohl rabi run through a root cutter.

"This system of feeding sows will continue until about March, when the rabi will have lost much of their goodness and the supply of them will be exhausted. Mangels will gradually take the place of the rabi, but in smaller quantities." * * * "We grow but very few swedes or white turnips, or these would take the place of kohl rabi. At one time we grew a considerable quantity of cabbages for the pigs, but we found that these caused constipation and were not at all suited for the little pigs or for young boars which were kept confined in sties. Even kohl rabi require to be sparingly used for the younger pigs or they will sometimes cause constipation."

Turnips are only fed in a small way in America, and then, I believe, usually boiled. Long states ("Book of the Pig," 1886, page 254) that they furnish an admirable diet when judiciously given, and that he has known many thoroughly practical feeders to use them largely in the winter with good effect. At the same time he says that numerous instances could be quoted in which they have caused disease, weak litters and even abortion. Like all roots, he says turnips should be cut up as small as possible for pig feeding and mixed with the meal at least twenty-four hours before being fed.

In Danish feeding experiments, when feeding barley and whey to pigs, turnips were substituted in part for whey. In two experiments with thirty animals barley and whey gave an increase of 1.08 pounds per head daily, while turnips gave 0.96 pound. The experiment lasted 130 and 110 days each. ("Experiment Station Record," Vol. VII, 1895-96, page 243.)

Pumpkins have for years been fed by our farmers to some extent to pigs, and while they have as a rule met with favor we know little of their feeding value on the basis of reports. The Oregon Station fed pumpkins to six Berkshire pigs, which were about eight months old when

the experiment began. The pumpkins were cooked in a vat and mixed with shorts. They were fed from October 30 to December 25. Reckoning pumpkins at \$2.50 per ton and shorts at \$12, the amount of the former fed was worth \$9.40 and the latter \$5.54, a total of \$14.94. The total gain in live weight was 499 pounds, making the cost of the food for 100 pounds of gain in live weight \$2. The pigs consumed large amounts of pumpkins, averaging for the two last feeding periods 26 pounds each per day. At first only small amounts of shorts were necessary, but later this amount had to be increased. The average daily gain for the entire period was one and one-half pounds per pig. The quality of the meat was very fine. ("Bulletin 54," Oregon Experiment Station, 1898.)

The real value of succulent food for swine can not be measured by simple gains in weight of pigs given such food. Undoubtedly where animals are confined to a pure grain diet the digestive tract is more torpid and sickness is more likely to occur than when succulent food is given. Then the digestive organs are more active and natural in movement and the body is better prepared to resist disease than when pure grain food is fed. The influence of this succulent food on sows in pig or sucking pigs can not be measured by the scales, but the general testimony of practical feeders of experience is that such diet promotes easy parturition, a generous milk flow and vigorous offspring. Pigs that are to be fattened in a short period of feeding do not perhaps need roots in their diet, though I believe it would be to their advantage, but breeding stock, both male and female, and suckling sows will certainly be materially benefited by summer pasturage and roots in winter. Swine should always be fed with discretion the first few days of turning on pasture to prevent bloat, but where roots are fed no special danger is likely to occur.

Of the summer pasture plants red clover and rape are undoubtedly the most desirable, while the sugar beet and mangel wurzel, all things considered, offer the cheapest food in the form of roots. Possibly swedes or kohlrabi are equally desirable, though they are probably more of an unknown quality with American feeders than the other two. Those roots with the greatest amount of sugar in them, however, will be eaten with more relish, and probably give the best returns, as is shown in the Danish experiments where the sugar contents of beets is reported on.

POOR STOCK.

No other branch of farming has been so remunerative for a few years past as the production of pork. This has been a stimulus to the farmer for adopting a better class of swine, as well as better methods of management and development. Still too many farmers are simply wasting time and feed on grades of swine that do not betoken for them the first speck of pride or ambition for keeping pace with the advancement of the times.

BEST SUMMER PASTURE FOR HOGS.

BY H Z CHURCHILL, ELIZABETHTOWN, KY.

To ascertain and discuss the best summer pasture for hogs is a subject upon which very few persons in any locality agree; and in writing anything about this subject one must take up and discuss it entirely from his own point of view and experience. Of course, different conditions and localities make different results. What might be the "very thing" here in Kentucky might not be at all advisable or practicable for Indiana, Illinois, or the trans-Mississippi States, as much depends upon latitude, climate and the adaptability of the soil that one may be so fortunate to own or cultivate for a summer pasture.

By the meaning of the summer pasture, I certainly would not confine it just to the three summer months June, July and August, but would add part of the spring and fall months, thereby covering a period so as to include the time of farrowing in the spring until the time the hog is old enough to be placed in the fattening pen in the fall to be prepared for the market, making our pastures not only for the fine pedigreed and show hogs, which are only sold for breeding purposes, but for the hog that is raised by every successful farmer for the market. The first thing to be considered in the arrangement of a good pasture is the water supply, for without good and wholesome water no pasture or feeding of any kind will be a success; no animal of any kind, however plentiful and good its feed may be, will thrive without water; it may be and is true that grasses contain a larger quantity of water than any other kind of feed, yet it does not take the place of water, nor should the raiser of hogs allow himself to think it does.

To start your hogs off in a thriving condition in the spring, when it is possible so to do, arrange a small lot and sow it in rye. Then by the last of March or the first of April, on all pleasant days, turn your hogs into the lot of green rye. The way both young and old relish it is wonderful indeed; nothing puts their system in so good a condition to stand the long summer months as this rye. Myself and partner were so fortunate this spring and part of the winter months to have the wheat so high that it was an advantage to both wheat and hogs to be turned on a fifty-acre field. To come right to the beginning of the summer pasture, nothing in my experience can compare to the clover field. It is certainly the "king of all pastures," and without it we would certainly be in a dilemma as to what to do and where to go at that season of the year for a substitute. Clover stands higher in analysis than almost any other grass for pasturage; besides it is very useful for the farmer, more so than

most crops, as a fertilizer, for nothing enriches the land more than this self-same clover when plowed under in the fall, after having been pastured all of the summer season to the fullest extent. If any hog raiser has never tried the virtues of a good clover pasture in summer, let him hasten to do so at once. Towards the last of the summer months all clover fields become somewhat rank and dry; from then on they are not ample for the thorough maintenance and growth of hogs. So other kinds of pasture should be provided. Look around and search your books on feeding and see if you can find anything that compares with cow peas; a patch of them would be the very thing required to finish out your summer pasture. The peas themselves stand ninth, and the hay twelfth in feeding value of all mill products, grain, green fodder and hay, which is very high, considering fifty American feeding materials are treated. Hogs love this pasture, and with the eating of the peas and the green pea vines they come to the fall months sleek and almost fat enough for the market.

In making a pasture of cow peas do not try and get all of one kind or variety. Get for the first a variety that will make a large quantity of vines and follow up with the variety that produces a great quantity of peas, so when cold weather comes the hogs will be prepared to take readily to grain that will then be given them.

The cow pea, like clover, improves the land instead of taking from it; in other words, it both fattens the hogs and fattens the land. So it follows, in summing up, that in the judgment of the writer, for the best results to the hog and the constant improvement of the land, the best summer pasture for hogs would be to start them off early on a rye or wheat field; as soon as clover is well enough advanced turn the hogs on and keep them there until the latter part of the summer, and then finish them for the summer on a good pasture of cow peas. By this method you will find yourself with a herd of fat, healthy porkers, and raised at a small expense. Not losing sight of the water supply, which should be plentiful and healthy, always remember that pastures for your pigs should contain grasses that are tender and juicy, if you wish them to thrive. Pigs do not have all of their temporary set of teeth until they are three months old, and, of course, can not bite or masticate anything old or tough; and when they do cut their temporary set they only contain about one-half as many teeth as they have when they have a full permanent set. One of the greatest causes of the death of so many pigs is because they are placed on food they can not masticate, and thereby die of many disorders.

In discussing the subject of pastures, I have lost sight of such pastures as rape, alfalfa and blue grass, for the simple reason that the writer knows nothing of the first two, as they are not grown in his section, and the latter grows on land that is too expensive in this State to allow hogs to run on, and probably root up, so as to destroy these beautiful pastures

that are the mainstay for the fine horses and cattle. However, when it is possible, the blue grass pasture is one of the very best to go side and side with the clover and the two mixed help wonderfully to make the ideal summer pasture.

It is sometimes, and I may say generally, that the pasturing of hogs is supplemented with feeding of grain. In fact, it makes a quick growth and fattening for the market and is commonly carried on by most feeders who ship young and quickly fattened stock. But I must urge that it is best not to make the feeding of any kind of animal too expensive, especially the hog. While we can buy a great variety of mill feeds that are very fattening, the question is, does it pay to buy these to put on this additional weight? I should think not; better not to feed at all than to make it cost more than can be realized. Just feed what you raise on your farm, which consists of corn and oats principally, and if you have any overabundance of either you might sell some of it and invest that money in shipstuff or shorts. I have found for a summer feed, with pasture, that a small feed twice a day consisting of two parts ground corn, one part shorts and one part ground oats makes an ideal hog food. This mixed with water the consistency of a thick slop and given about six quarts twice a day to each grown hog, with about half the quantity to shoats, is all they require in summer while running on pasture.

PASTURING PIGS ON STUBBLE.

No matter how carefully grain is harvested, some always escapes the reaper, and unless stock is turned on the stubble it is lost. While the amount may hardly be sufficient to make it profitable to follow the machine with a rake, the scattered grain may be profitably utilized by turning pigs or other stock into the fields, and as a matter of fact, the custom of pasturing hogs on such fields is quite common. Some recent experiments along this line are reported by a Farmers' Bulletin, Agricultural Department, to show the value of this kind of feeding with other methods.

Forty-one pigs from six to nine months old were allowed the run of barley, wheat, and pea stubble fields of 18, 10.44, and 10.73 acres, respectively. For some time before the test they had been pastured on alfalfa and fed one pound of cracked barley per head daily. For ten weeks immediately preceding the test, they made a daily average gain of .42 pound per head. While pastured on the stubble fields they were given no grain in addition to what they could find except on stormy days. The grain thus fed amounted to 24.1 pounds in the five weeks of the test. During this time the pigs made a gain of 22.8 pounds per head, or 17.5 pounds, deducting the amount which it was calculated they gained from the grain fed during stormy weather. On the supposition that 4.5 pounds of grain

are required to produce a pound of pork, the forty-one pigs gathered 3,228.75 pounds of grain, which otherwise would have been lost. The harvesting had been done in the usual manner, and, in the investigator's opinion, the amount of peas and grain remaining in the field did not exceed that left in the stubble fields on the average farm. The scattered grain could not have been saved in any other way, and represents a clear profit. The grain saved from the stubble fields by these pigs was not all that could have been gathered if they had remained in the fields a longer time. Seven brood sows were afterward pastured during the winter on the Station stubble fields, which included a twenty-four-acre oat field in addition to those mentioned above. They were given no food in addition to what they could gather, except kitchen slops and a small grain ration on stormy days. The sows frequently rooted down through six inches of snow and found sufficient grain to keep them in good condition throughout the entire winter. It is stated in a recent communication from the Montana Station that several brood sows have been pastured during the past season on stubble fields without receiving any grain in addition, and that they are in fair condition. They had, in addition to the grain stubble fields, the range of clover, alfalfa, and timothy meadows, and the gleanings of fields where root crops had been raised. The manure from grain-fed stock, which was spread upon the fields, also furnished some gain.

CLOVER FOR HOGS.

To produce the cheapest as well as the best pork, clover must be the mainstay of the swine breeder. How to get the most out of the clover crop is a question good farmers are somewhat divided in opinion upon. Some advocate that hogs should not be turned on clover until it begins to bloom. Mr. S. Farill, of Wisconsin, and a very successful breeder, says: Instead of waiting until it begins to bloom I should let them in as soon as the clover is fairly started—say from four to six inches high—and I would put in hogs enough so that they would keep it down so that but little, if any, of it would get up enough to bloom. And then if we have fairly seasonable showers we shall have a fresh pasture nearly all summer. But if they are not turned in until the clover begins to bloom it will be nearly full-grown and the hogs will only eat the top off, and the whole field will soon become old and woody and they will eat but little of it. It is true it will, to some extent, spring up fresh, but only in a small way compared with what it will if it is kept cropped off so that it does not head out. A little thought will discover the reason for this. The whole effort of the plant is for reproduction, and as that is done through the seed the plant will continue its effort to make seed until the strength of the root is exhausted, so that reason and experience teach that the usefulness of the clover plant for summer pasture can be greatly

prolonged by keeping it from heading and blossoming. This is equally true whether hogs or neat stock are to be pastured on it. There is no question about the economy of growing hogs on clover pasture, provided one has the right kind of hogs. But just here comes the trouble. Hogs to do the best on clover pasture must be at least five or six months old, and if we would have them on hand for the early spring clover it means wintering them, and that I have of late years entirely abandoned—only wintering my breeding stock. I breed two litters a year and see to it that the pigs from start to finish have the best of care and feed till they go into the market at from six to eight months old. It is the statement of Mr. A. J. Lovejoy that 400 pounds of growth can be made from an acre of clover. I accept his statement, and will go him 200 pounds better. I have made 600 pounds' growth from an acre, by actual weight, not guess-work. This was the way of it: I have all my life been a hog raiser, and always tried to have a pasture for them in the summer, in connection with their other feed, and I always considered the pasture a valuable adjunct in successful hog raising, but I never was so situated but once that I could tell, without too much trouble, how much of the profit should be credited to the pasture. A few years since I found myself with an eight-acre field of clover that had come through the winter very nicely, and I decided to see how much pork I could make from that field of clover. I bought fifty shoats that were from six to eight months old. They had been fairly well wintered, but were not fat; their average weight was 100 pounds. They were put into the clover fields when the clover had gotten about four inches high, and were kept in that field until the 15th of September, when they were sold, and their average weight was 225 pounds. But that is not the whole story. These hogs were fed, in addition to the clover pasture, one pound (by weight, not guess) of shelled corn for each hog per day. That was all the feed they had. They had free access to good, clean water. Their drinking trough was kept full by an automatic arrangement connected with the water tank. It was covered so they could not get into it to foul it. They had free access to salt and wood ashes mixed in about equal parts, kept under the shed so as not to be wasted by the rain, and I was surprised at the quantity they ate of it. The corn was fed regularly once a day, at a little before sunset. The first month the corn was soaked in water twelve hours; after that it was fed dry, another small item of importance. The corn was not fed in troughs or even in piles, but was scattered broadcast so they were obliged to eat it slowly. This may seem like a trifle, but success or failure is often determined by these little things. It was so with the regular feeding of corn; hogs (like the rest of us) are creatures of habit, and they soon did not look for any feed, except in the pasture, only at evening. This is not quite all about that clover field. In the early part of June I found that the hogs were not keeping all of the field cropped down, but were leaving bunches that were commencing to blossom. I turned eight

head of cattle and two colts into the field and kept them there four days. After that the hogs kept it down. In the final summing up of this matter I gave the clover credit for 600 pounds of the gain to the acre, and charged the balance of the gain, 1,450 pounds, to the corn. That would fully pay for all the corn they ate at 50 cents per bushel. Whether this division of the gain is a fair one others can judge as well as I. One thing is certain, the result of the experiment was quite satisfactory. But the conditions were all favorable. The hogs were about the right age and condition, and we had rain often enough to keep the clover growing. These favorable conditions can not always be secured (the mechanical part can), so one can not always be sure of such satisfactory results. But it will always be found profitable to have clover for growing hogs. It is cheaper feed than corn.

STREAKS OF LEAN.

BY I. N. COWDRY, GRATIOT COUNTY, MICH.

There is too much fat pork used in the family. Good pork is healthy, and makes the best of meat, but it is usually too fat. Now, there is a way to fatten for lean pork, as well as for fat pork. I remember years ago we thought that a hog should be made so fat that it couldn't get up. This was invariably the rule we went by if we had corn enough to put them in that condition. The hogs were put in a pen, with a floor, early in the fall, and fed corn and water until after Christmas, when they usually contained enough "blubber" to satisfy. Then butchering day came, and sometimes as many as seven large hogs were killed and packed down for the year's use. Then this ended the work of butchering for another twelve months. Of course, headcheese and liverwurst had to be made, which has become a lost art with us now, except the sausage part of it. Practically, nearly everything about the hog was used up then, where much now goes to waste. I remember that my part at butchering time was the tail. It was cut off and given to me. I would slice it around with a butcherknife, put salt and pepper on and roast it on the live coals. This I thought the most dainty part of the hog. Perhaps because it was not so fat as the rest.

The country was new in those days, and a great deal of hard work had to be done clearing up the farms; and I can well remember how hungry I would get before noon and long for the big chunk of fat meat with beans or cabbage that we were almost sure to get for dinner. In those days in the cold winter time, when we did the chopping, the fat meat was most welcome.

But those days of hard winter work are done with most farmers in the United States, and it naturally calls for a different kind of meat. More lean is desired. Smaller hogs are in demand. Instead of the hog weighing 500, a 100 or a 200 pig is asked for, and instead of having one butchering day in the year three or four such days are now required to satisfy the changed conditions. Now, how shall we do to get this streak of lean and streak of fat pig pork—the sweetest and best of all meats? Why, feed for it, of course. Commence as soon as your pigs are farrowed. Feed bran and middlings to the mother to develop bone and muscle. Make long, rangy pigs of them instead of chuffy ones. Be sure to have plenty of good pasture for them all summer if you have to sow it for them. Rye, oats, clover and rape make good pasture for them. When the pigs are three months old they can have considerable corn if they have plenty of pasture. If the corn is hard it is best to soak it about a day before feeding.

Now, if you want some choice meat for your own use, select out as many as you want and feed them separately from those that you intend for market. Select long, rangy fellows, with big bone and deep up and down, and narrow on the back. This is the bacon type and makes the best meat. Don't select a blocky or chuffy one, for there will be too much fat. Let the most of their feed be pasture, milk, bran, and other cheap slops, with a little corn, not much. Increase on the corn as the pigs grow, and the last six weeks before killing they should have all the corn they can eat up clean two or three times a day. Don't shut them up on a floor, but let them have the run of a good pasture lot until ready to kill.

For the best of pork the pig should be a rustler, wide awake and not lazy, always active and a good runner. This is the kind of pig that will sandwich a streak of lean through the fat, and smells good while cooking and tastes good for dinner. This is some trouble, but the best things always make some trouble to get them.

CONVENIENCES FOR HANDLING HOGS.

BY W. A. HART, PORTLAND, IND.

A visit among those engaged in caring for hogs will convince any person that the same thought and talent have never been expended upon devising means for the convenient care of hogs that have been expended in almost any other line of farm work.

The most of us seem to imagine when we start with our pail of slop that it is necessary to the comfort of the hog that we permit ourselves

to be run over and trampled down just as the feeders did ages ago. This article is prompted by reason of the old-time careless, inconvenient method being generally in vogue.

First among the necessities for conveniently and successfully handling hogs is a convenient feeding house. Much improvement may be made in this respect. Many have expended hundreds and even thousands of dollars for feeding houses and yet find them so cumbersome and inconvenient that they seldom, if ever, use them for the purpose for which they were built. A feeding house that does not lessen the work of feeding, that does not give better return for the feed used, and that can

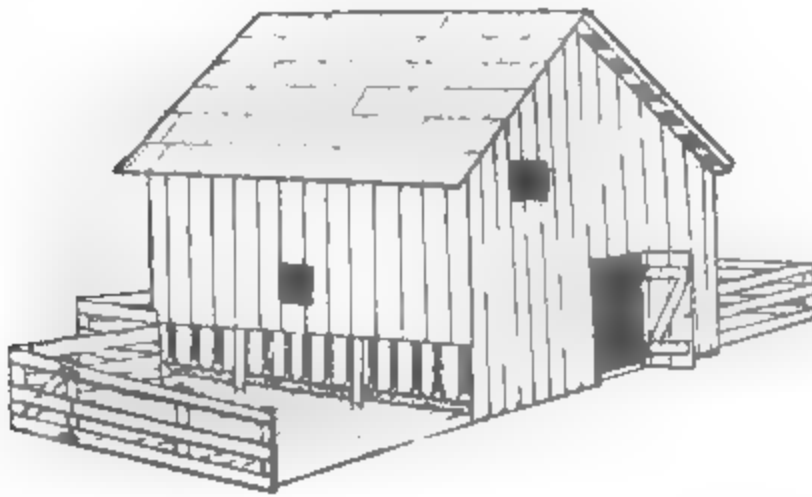


Fig. 1. FEEDING HOUSE.

not be built with but trifling expense, can never come into general use among farmers. An effort will be made in this article, aided by the accompanying illustrations, to describe a feeding house that accomplishes these results, so that any carpenter or intelligent farmer can build such a house. As an illustration, I will use a feeding house fourteen feet square and eleven feet high to the eaves, with ordinary comb roof of the desired pitch. Such a house is shown in Fig. 1. It may be a surprise to the reader to learn that such a house will furnish crib-room overhead for 450 bushels of corn, bin-room on the ground floor for nearly two tons of ground feed, convenient troughs and feeding rooms for more than fifty hogs, three good stock fountains to furnish pure water to three different lots, and all at a cost of less than \$100. The hogs do not go inside of the building at all, but eat slop from a V-shaped trough, the outer edge of which comes out even with the outer edge of the building. This trough arrangement extends around three sides of the building, giving a length of about forty feet of trough. Outside of the building at each side at which there is a trough, and fitting up against the building, is a tight plank floor, eight feet wide and extending the full length of the trough. This platform is enclosed with an ordinary board fence, with the bottom plank of the fence resting down tight upon the floor, to prevent the hogs from rooting ear corn off the platform. A small gate or door is made in

this fence that the hogs may be shut in or out of this pen. The house on the three sides at which the troughs are placed is weatherboarded up and down, but the siding only extends down eight feet from the eaves, thus leaving a space of three feet between the bottom end of the siding and the ground, through which the hogs eat out of the trough.

The trough shown in Fig. 2 is the old-fashioned V-shaped trough made of two solid oak planks, each one and a half inches thick, the one eight and the other ten inches wide. Pieces of plank are nailed on the end of the trough in the old-fashioned way, but are cut exactly as long as the trough is wide at the top. Two pieces of inch plank eleven and a half inches wide must then be cut long enough so that when the lower end

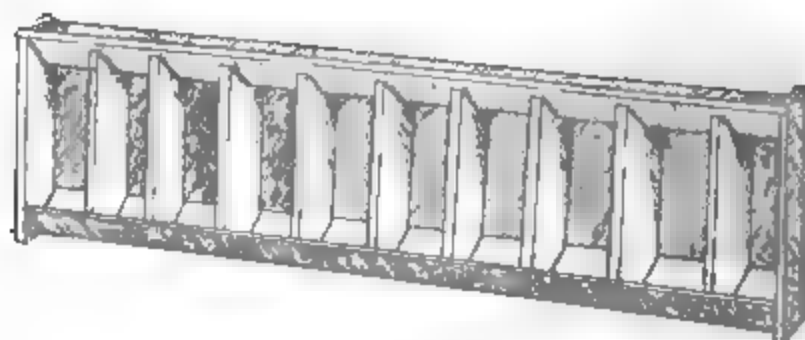


Fig. 2. A CONVENIENT TROUGH.

is made fast to the end of the trough the upper end extends an inch or so above the lower end of the siding of the building to which it fastens.

This trough is then partitioned off into spaces of from eight to fourteen inches, to suit the size of the hogs to be fed. This partitioning is done with inch plank eleven and a half inches wide, standing with the lower end fitting down into the trough and cut long enough so that the upper ends extend up to within about two inches of the lower end of the weatherboarding. These partition boards must lack about four inches of being cut to a point at the lower end, leaving space at the bottom of the trough for slop to run from one end of trough to the other. Use plank tongued and grooved the length of the trough for back wall. Let the first plank so used fit down tightly on the inner edge of the trough. Board up to about four inches above the upper end of the partition board of the trough. Cut a board nearly a foot wide just the length between the two boards standing upright that are nailed to the ends of the trough. Fasten one edge of this board to the inside of the weatherboarding above the trough so that the other edge will rest on the upper ends of the partition boards set in trough. This board and back wall nailed fast to the partition through the trough into the lower ends of the partition boards serves to hold them in place, and the back wall and this board form a hopper into which to pour the slop. This board throws the slop back against the back wall as it descends to the trough and prevents the slop from falling on the heads of the hogs. It is for this reason that the back wall must be watertight.

Fig 3 shows the inside arrangement on the ground floor. The three troughs will be noticed in place around the three sides. The bin for ground feed is seven feet square and built in the center, and extends from the ground floor to the floor overhead, and is built very strong to help support the floor overhead. This leaves a space three and one-half feet wide in the front end of the building and two and one-half feet wide next to the troughs, to pass around and pour in slop. A three-quarter inch pipe running into the house from a small tank outside and following around and fastened to the back wall of the trough, furnishes the water to automatic stock fountains, one placed in one of the end spaces in each of the troughs. The partition at the space in which stock fountain is

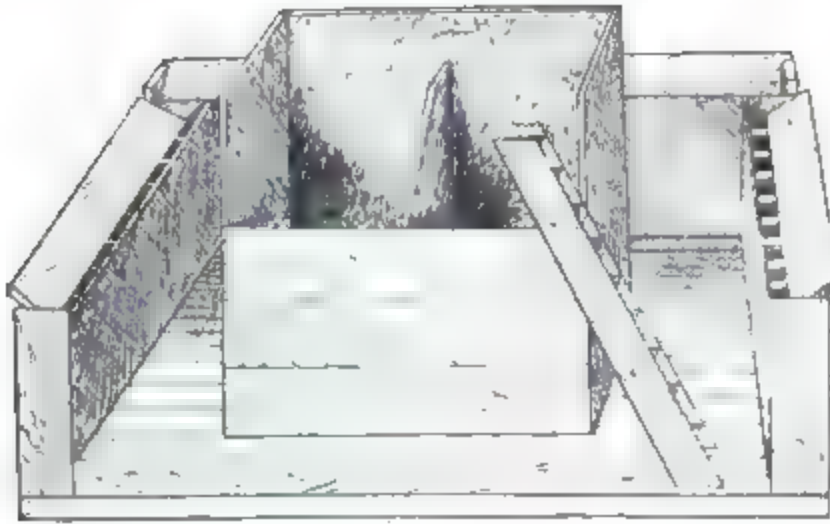


FIG. 3. INSIDE ARRANGEMENT OF FEEDING HOUSE.

placed must extend to the bottom of the trough to prevent slop from running into this space under the fountain. The steps from the ground floor above slant toward the center of the building, so that the landing is near the comb of the roof. Board up around the landing, about three feet high, to prevent corn from falling down stairs. You will notice from cut No. 1 a small door immediately over the trough from which to throw ear corn on to the platform. If shelled corn is fed it can best be fed in the trough. With this arrangement the feeding can all be done from the inside of the house, and it is impossible for the hogs to dirty or waste the feed. Besides, the partitions in the troughs prevent the hogs from fighting and pushing one another. It is much less work to clean out the feeding pans when they are outside than when they are inside of the building. A separate lot is used for the hogs at each side of the building, at which a trough is placed. These lots are made about twenty-five rods long and each contains about one and one-fourth acres.

A sleeping house, which is described below, is placed in each of these lots at a point about twenty-five rods from the feeding house, so that the hogs may be compelled in bad weather to take exercise of going to and from feed.

Another convenience that is indispensable for handling hogs with profit is a good sleeping house. The sleeping house as illustrated by cut No. 4 possesses many advantages over almost any other plan used. The side walls should be made about eighteen inches high, and the roof, a comb roof, at half pitch. A small door, to be kept closed except one may need to open it to aid sow at farrowing, should be made in back end, and an opening in the front end only large enough for the hog to go in and out. No door is required in the front end, which should face to the south. The strip of timber across at the bottom of this opening should be two inches thick and six inches wide. Sufficient dirt should be thrown inside of the house that water will not run into it, and a plank floor laid flat on the ground to prevent draft from beneath floor. A small box should be securely fastened in one of the corners at the front end of this house in which to place salt, lime, ashes, etc., for the hogs. The bed at farrowing time

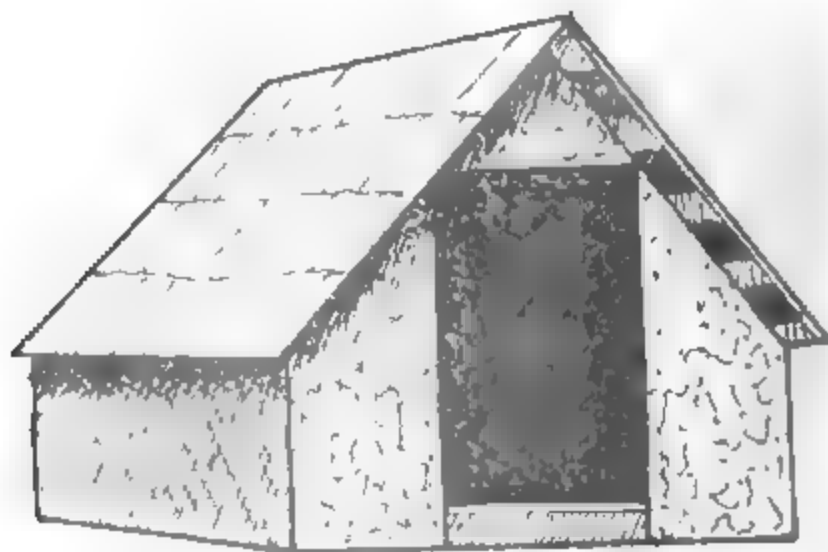


Fig. 4. A VERY SATISFACTORY, INEXPENSIVE SLEEPING HOUSE.

should be of some material that will not bunch badly and will keep the pigs as dry and warm as possible. For bedding older pigs or hogs a bed of dry cobs from the corn-sheller filled in five or six inches deep all over the bottom of the house will be found much more satisfactory than anything now in general use. Slaked lime should be scattered plentifully through the bed. Such a bed is always dry, free from dust, and the hogs can not cover up in it and get too warm. Besides, even in bad weather, it seldom needs to be changed. The low side walls and low roof prevent the sow from lying too close to the side wall and crushing her pigs.

The single opening prevents draft, and the weather has to be excessively cold when the heat from the body of the sow does not keep the house warm and comfortable. The house should be no larger than necessary to accommodate the hogs sleeping in it. Unless the sow is very large, five feet wide and six feet long will be a very good size for the house for sow and pigs, and where twelve to fifteen hogs sleep together,

unless they are very large, a house eight feet wide and ten feet long will be found large enough. In changing bedding upend the house, burn the bed on the space occupied by floor of house, and replace the house on space burned over, and re-bed as before. The smaller-sized house may be built at a cash expense of not to exceed \$2. A trial of such a house so arranged will convince any farmer that a hog can be made to gain a pound a day with the feed on which the same hog with poor shelter and a wet bed will make no growth.

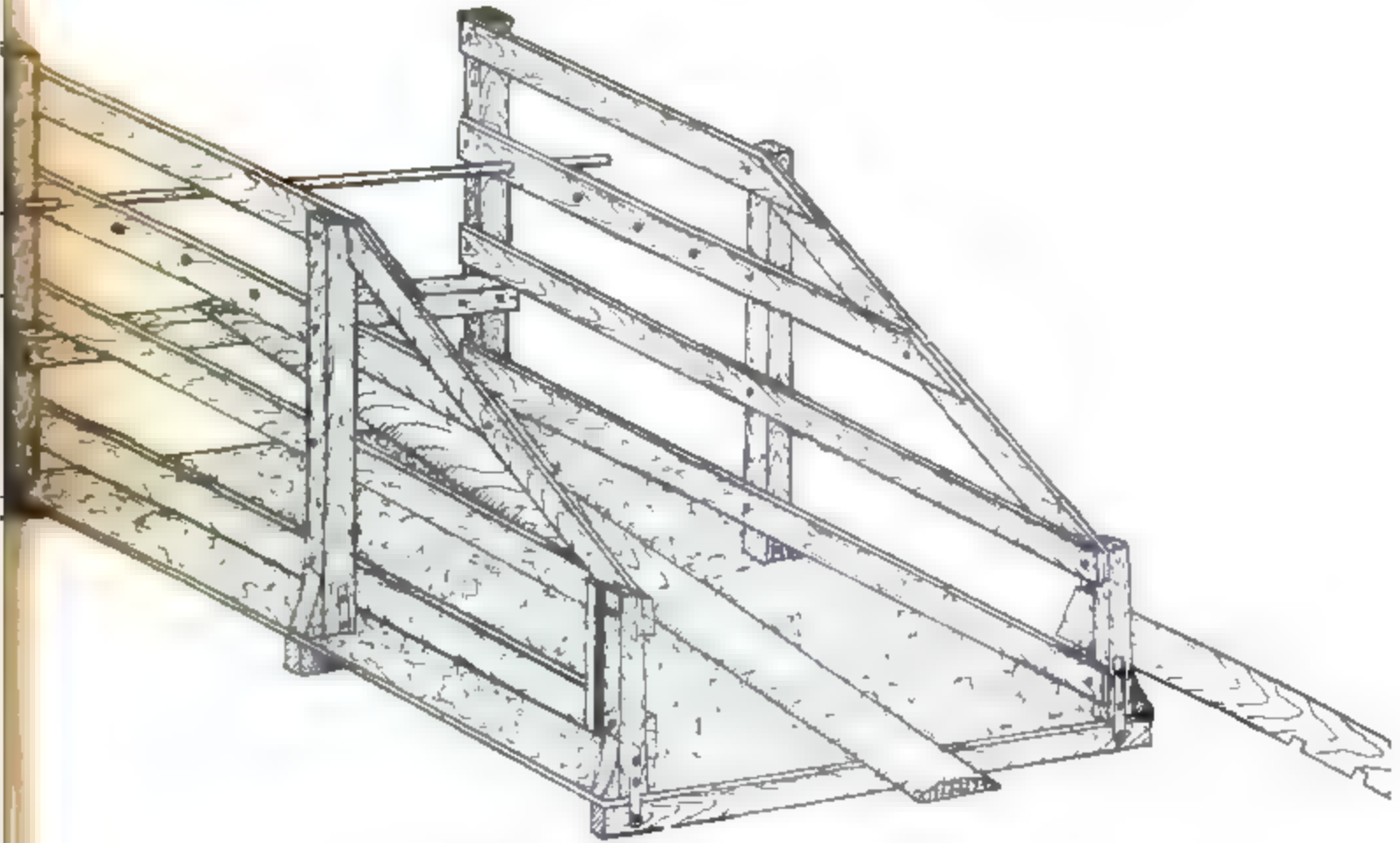


FIG. 5. A HOMEMADE BREEDING BOX.

Another convenience that is indispensable, if a properly developed, mature boar is used, is a properly constructed breeding box. Such a box is shown by cut No. 5. By the use of a breeding box it matters not how small the sow, she may be bred to any sized boar, and always receive a good service. Any boar gets better litters of pigs and has much less trouble about getting sows in pig where the box is used.

In order to accommodate all sized sows, the floor of this box is made thirty-two inches wide and five feet four inches long, and is nailed to three cross pieces two by three inches, placed an equal distance apart underneath the floor. The upright pieces are two by three inches and the two longer ones on each side are thirty inches long and the shorter one

on each side is same size and fourteen inches long. The cut shows straps of iron on each side of these upright pieces and extending down through the floor so that the ends of the straps of iron fit in each side of the cross piece underneath the floor. A bolt extends through the lower ends of these straps of iron and through the cross piece underneath the floor to hold the side of the box in place. In from the row of mortises in the right side of the floor five inches and ten inches a second and third row of mortises are made, that this side of the box when the sows to be bred are smaller may be moved in and thus make the box narrower to suit the size of the smaller sow. The body of the sow should fill the space between the two sides of the box. The board lengthwise in the center of the breeding box is five inches wide with the two upper edges rounded off. This board is bolted at one end to a cross piece about ten inches above the floor. This cross piece also has holes bored in end to suit the different widths at which box is used. The high open end of the breeding box should be placed against a fence or side of a building when used. The cut shows the box ready to receive the sow. As soon as the sow goes into the box astride the board the end of the board now resting on the floor is raised up between her hind legs and the notched bar shown in the cut is slipped through the end of the box under the end of the board and behind the hind legs of the sow.

This prevents her from backing out of the box. The notches in this bar fit over the edges of the side pieces of the box and prevent it from spreading. A row of auger holes is bored in one of the strips on each side of the box through which a piece of half-inch gas pipe is run at proper place to prevent the sow from running too far forward in the box. A plank platform two feet wide and three feet long should be placed at the lower end of the breeding box immediately behind the sow. This platform may be propped up higher or lower to suit the boar to the height of the sow. The timber, iron, bolts, etc., for such a box will cost about \$1.25.

SNARE AND HURDLES.

Two other conveniences that are inexpensive and yet indispensable in handling hogs are a snare and a hurdle. The snare is made of a piece of small, stout rope, about six feet long, with a slip-nose in one end to slip over the upper jaw of the hog, and a short stick tied to the other end to take hold of. A hog becomes perfectly manageable when the snare is put on him. Hurdles are made of parts like small gates about thirty-two inches high and four feet long. The most common form of hurdle is made of two of these parts connected in the center by a pair of strap hinges. A man at each end of the hurdle can corner and catch almost any hog, and by the use of the snare and hurdle hogs soon become as manageable as any other kind of stock.

WHAT THE HOG HAS DONE FOR THE FARMER.

BY THEO. LOUIS, DUNN COUNTY, WIS.

It is a difficult matter to do justice to this subject. From the days of our Pilgrim Fathers he was the companion and supporter of the pioneer on his journey westward, until his abode is in every State and Territory of the Union from the Atlantic to the Pacific. On the plains and in the Rockies (the home of the buffalo, the antelope and the grizzly) he reigns supreme, at home in every clime, the ever true abiding friend of the pioneer. It would give volumes of interesting reading if farmers had left behind stories of his individual benefit, ever dividing the hardships, with a contented grunt for the smallest favors. It would be the story of millions that the hog laid the foundation of their happy, free and independent homes—if we were not so forgetful and did not ascribe success to our own individual efforts, forgetting that in the mighty struggle he divided the hardships of poor shelter, storms and starvation. It was he that furnished the main staple of wholesome nutritious meat and the necessities of life; he paid for shoes and winter garments; it was he that paid for the first cow, he that paid for the first plow; it was he that furnished the money for taxes, however small they were, but they were cash. When other products had to be sold for half cash and half trade he demanded cash and it was ever forthcoming. He walked to his burial and future home and liquidated the note on the team; he bought the school books; it was he that paid for the material for stable, for horses and cow; while he without a discontented grunt took his abode in a straw pile, and his mate brought forth lusty litters, any one of which would excel the three-year-old steer in value in ten months. It was he that paid the doctor bill, he that lighted up the first Christmas tree and furnished the toys for the kids, the first merino dress, calico and trimmings, and caused the smiles and tears of joy. It was he that replaced the log hut, the sod house, the shanty, with comfortable and often stately homes. He paid for the education at city schools, and the professional boy forgets that his superior education is somewhat due to the American hog.

The wheat farmer of the West, that trusted his all in wheat until it went below the cost of production, found in him his savior—he paid his way, ten pounds per bushel, live weight. His presence changed agriculture on the plains; he ate alfalfa, clover and bluegrass. Corn was no longer a drug on the market, but a remunerative freight product for railroad. It was no longer fuel—he replaced it with coal and gasoline. He brought about mixed husbandry. Go where you will, if you find him in-

telligently cared for with a liberal hand, the farmer's reward is sure to come.

In 1898 he found his way to distant shores in—

Live hogs	\$110,487
Bacon	46,380,918
Hams	18,987,525
Pork, fresh	815,075
Pork, pickled	4,906,961
Lard	39,710,672

Total\$110,811,638

American farmer, read, think, stick with intelligence to the American hog, better his condition, stick to him as he sticks to you, brother-like. They tell you that he is not what he should be, they show you figures of sales and exports, but all sink into insignificance in comparison with the American hog.

TREATING THUMPS IN PIGS.

BY W. S. HALEY, WILSON COUNTY, TENN.

Thumps is one of the most disastrous diseases among hogs. In fact, I believe it keeps more pigs from reaching the smoke-house than all other diseases combined. Its ravages, however, are almost entirely confined to shoats or pigs, so we do not feel the loss from them as badly as when cholera takes off the same number of large hogs, yet where real cholera kills one hog, thumps take off pigs by the score. Then how to prevent thumps and how to cure them are subjects of vital importance to every hog-raiser. For thumps, as for all other diseases, preventives are better than cures, still, after all known precautions have been followed, we will have a few cases of thumps, then we have a need for a remedy. The most frequent causes which have come under my observation, I believe, are exposure to bad weather, sleeping in dust, a want of a properly balanced ration, and a lack of proper exercise. The last mentioned cause of thumps is often really the effect of one or all of the preceding, yet it is sometimes due to pure laziness in the pig and that laziness the result of the way the pigs are fed. The sleeping quarters may be warm, dry, and free from dust; the pigs may have access to them at all times as they certainly should have; and the food may be of exactly the right nature as far as we can determine and plentiful at that; if it is always fed to them from the trough

the pigs will become lazy and inactive, and their health will be endangered. I have actually seen pigs that had been fed that way starve to death before they would get out and get something to eat when good succulent food was plentiful at the cost of just a little exercise. That seems strange, but it is true nevertheless. In a bunch of forty I bought one spring there were ten pigs that had been fed on slops and scraps in that way. They were the prettiest pigs in the lot. I turned them into a plenty of green rye and artichokes, but neither of those ten would work for a living. I fed them for awhile and tried to reduce their feed gradually, but they would not get out of their lazy wallows. I would toll them out into the field every day, but they would go right back to their wallows. They would eat the roots greedily if fed to them, but they would not root nor graze. Right there in one month five of those pigs starved to death, and it was only by the greatest patience that I ever induced the other five to quit their lazy habits, while the rest of the shoats did well. So my advice is to have plenty of good food, but let the pigs gather for themselves as much as possible in good weather. Teach them to be industrious, be careful to provide good sleeping places, keep them free from lice, and you will reduce thumps close to a minimum. As I said before, after all possible caution we are likely to have an occasional case of thumps. Then we need a remedy. I know of none that is infallible, but I have had real good success with a very simple treatment. I have never seen a case of thumps in a pig without there being some constipation, and often the bowels are terribly hard. I remove this evil by injecting some warm, greasy suds by means of a syringe, about once a day until the bowels are regulated, or give castor oil for the same purpose, but I prefer the former method as the relief is immediate and the stomach unmolested. Then with either treatment give regular feed of good slops, scraps of meat, potatoes, etc. Induce them to eat but do not overfeed.

HOW LONG TO FEED HOGS.

It is often a question as to how long a pig should be fed before it should be marketed, or rather at what weight it is best to sell in order to realize the best profit. There is one fact pretty well settled, and that is, the greater the weight of the animal being fed the greater the cost per pound for the gain secured. But no set rules can be given, as conditions must always be considered in determining which is best. Sometimes it will be better to feed longer and for a heavier weight than at others. There are two kinds of days that are unfavorable seasons for feeding. These are extremely cold days of winter and extremely hot days in summer. Of course on the farm and especially when it is an item to feed

out the greater portion of the products grown upon the farm to stock on the farm, some stock must be fed during these seasons, but as far as possible these should be either young growing stock or breeding animals. This is especially the case with hogs. In fact, in many cases it will be better to sell a little lighter weight than to feed through the summer. In fact, generally light weight hogs, averaging 150 to 175 pounds, will bring better prices per pound than those of heavier weight, and when, in addition, the unfavorable conditions of growth with the risk of loss, are taken into consideration it will be better to sell in June rather than to feed longer.

It is always advisable so far as possible to have hogs sent to market in a good condition, and it will pay to commence in good season in order to secure this. But it is rarely advisable at this time to feed for heavy weight when this would compel feeding through July and August before marketing.

It will be a good plan to look after the pigs and push the growth of all that can be put in a good marketable condition by July, and all these should be sold, feeding only young, growing pigs and what breeding hogs it is considered best to keep.

BREEDING AND FEEDING HOGS.

BY P. W. PETERSON, VERMILLION, S. D.

Hog-raising is a financial issue; the problem now before us is what kind of hog shall we breed, and what shall we feed to produce the most dollars and cents in the least time and with the least feed. On this point there is a diversity of opinion between farmers, breeders and professors of agricultural colleges, but not so much on the feed as on the breed. We all have some idea as to what we want in the shape of a hog, some preferring one kind and others something different, and with some color makes considerable difference, and they will sacrifice some quality to obtain the desired color, while knowing that the market price makes no difference as long as the hog carries the required quality and finish. The selection of the sow is the first and most important matter for the breeder to consider. Some people are satisfied when they have a sow that will raise a large litter of pigs, but do not stop to consider either the feeding qualities or early maturity, nor symmetry in form, which is so very essential in the foundation of a herd. I have noted some farms where there have been all colors and all shapes of swine, and these have been used as brood sows, and in nine cases out of ten these sows have all been mated

with the same male. Such breeding is simply ridiculous, and shows the inability of the breeder to understand his business. It is this kind of breeding that degenerates size, quality and would in two or three crosses bring the hogs back to where they were twenty or thirty years ago, and we would still be annoyed by razor backs and rail splitters the same as our southern neighbors are this very day, where the hogs are all let run at large and breed at nature's will. By comparing the up-to-date bred hog with the wild razor back of the South, is it any wonder that the breeder of improved hogs feels proud of his success? These men, the improvers of hogs, have been very careful in the selection of their breeding stock and have not selected anything for breeding purposes which has not shown up the necessary qualifications to help to promote an ideal hog. In selecting their brood sows they have picked those that had the qualifications for thriftiness, short wide nose, which denotes strength, wide between the eyes and ears, which denotes intelligence, wide between the forearms, a full neck, a well filled heart girth, and a well-sprung rib, which denotes good lung power, an active heart, and a robust constitution. Then comes the straight, wide, slightly arched back and shoulders and hams to compare, all put upon four straight, stout legs well set out on the corners. After they have chosen their brood sows as near to these qualifications as their circumstances would permit they have then to set about getting a herd header which, upon past experience would induce them to believe, would produce good results by mating, and helping to improve the most deficient point in their herd. Now then we have arrived at one of the most critical points of the hog business, which is the time of breeding. It is as important to have your hogs in the right condition at this period of time as it is to have a steam engine in condition before you fire up. If you do not something will go wrong during the event and the manager of the engine or the herd of hogs will have to suffer the consequences of his neglect. In order to acquire the best results from your breeding, it is necessary that your hogs should not be too fat, rather a little thin and on the upward turn, on moderate feed as under those circumstances your sows and male both are more apt to be healthy, strong and vigorous, which is very necessary in order to produce a large, healthy, strong litter of pigs. After breeding it is also necessary that your sows should be dieted in order to obtain good results at farrowing. By dieting, I mean that the sows should be fed diversified feed which has a tendency to produce more bone and muscles than fat. It is to the detriment of both the mother and the young to feed a full corn diet at this time. I have had very good luck with my brood sows by feeding them one-third oats, one-third barley, and one-third corn chopped and soaked twelve hours before feeding, but I allow them to take plenty of exercise at this period of time, and as a tonic I feed them beets, mangelwurzel or potatoes, whichever I happen to have. Either of these are first-class substitutes for green pasture in summer. I also intend to feed enough of the above rations

from breeding to farrowing to keep the sows on a steady gain. I prefer a sow in pretty good flesh at farrowing time, which enables her to withstand the pressure for a long time caused by the sucking pigs. At and after farrowing we must be very careful as to what and how much we feed the sow, as on the first few days' feeding depends altogether the welfare of our young litter of pigs. It is also necessary in cold or chilly weather, that the youngsters should be watched and cared for so they do not chill right after birth. I keep a stove in my farrowing house, and as soon as a pig is born he is carried to the stove, wiped and dried by the fire. I then leave him by the stove to exercise and wait for the next pig which goes through the same performance. After the labors are all over, and I have a whole box of nice, lively pigs, I take them to the mother, and give them their first meal, and see to it that they all get something to eat. I then put them in the box again and place it by the stove where the little beauties will lie down to sleep, quiver and sneeze to show how they appreciate the warmth of the fire in the new world. They are kept in this box for one or two days, according to the weather and the disposition of the mother, but are taken to their mother once every three hours to be fed. After the pigs are a couple of days old they commence to feel very independent, can stand considerable cold, and can keep out of the way of their mother's feet. As I said before, the feeding of the mother plays a very important part at and after farrowing time. I shall tell you my experience, and how I feed at this time. Twenty-four hours after farrowing I feed the sow her first meal, which consists of some light food made into a swill and about one ounce of Glauber salts mixed with it, and of this mixture I only feed about one-half regular feed for three or four days. After that I commence to increase the feed very slowly minus the salts until I have her on full feed in about ten days, but I never feed more than what she is willing to clean up well before she leaves the trough. By giving a sow a little too much feed after farrowing, especially heavy food, it will create a fever which will terminate in milk fever, which is very fatal to her young and dangerous to herself. Too rapid an increase in the mother's feed will increase the flow of her milk in excess to the demand of her young, and as they will only nurse what they need the rest is left in the udder, where it will become stale and unpalatable to the youngsters. The next time they nurse, they will nurse less, leaving a larger surplus of milk in the udder which will at once commence to clot, and we then have what we call a clotted udder, which also brings on a fever, and if the pigs will nurse at all, you are sure to lose a part, if not all of them, from the effects of the feverish milk, and in nine cases out of ten your sow will go dry, and if any pigs remain after nursing the feverish milk, they starve to death. In most cases of this kind, the experienced man will lay the fault to the sow saying she is no milker at all; she is just starving her pigs to death; while the fact remains that he is to blame, and no one else. By judicious feeding we can avoid all this trouble, and

then have a slick, growthy, looking litter of pigs, and there is nothing better looking on the farm among the domestic animals than a nice even litter of pigs. When pigs are about five weeks old they should be taught to eat by themselves, separate from their mother, in a place made for that purpose where they can eat without being disturbed. As they proceed to learn to eat, the mother's feed should be decreased, and prepare her to wean her pigs with as small a flow of milk as possible. After weaning, these pigs should be kept on full feed and fed three times a day of milk and shorts, ground barley or oats with one-half corn meal which should be made into a slop and let soak from one meal to another, but care must be taken to see that this swill is always kept sweet, as acid from sour swill will ruin the digestive organs of young pigs, which will leave the system susceptible to any disease within reach, and then your hog business will be unprofitable. After a pig is past five months of age his digestive organs are stronger and can digest more heavy food, stand more abuse and still thrive. At six to seven months of age those that are intended for the market should be separated from those intended for breeding purposes and should gradually be put on full feed and pushed to a finish as soon as possible. In order to finish a hog he should be on a full feed of corn, but after you have got him as fat as he can be without detracting from his comfort put him on the market at once for he is very unsafe to keep because a hog fattened on a corn diet is very tender and cannot stand any abuse or disease. These hogs kept for breeding purposes should never be put on a corn diet but should be fed feed that has more bone and muscle producing qualities.

VALUE OF PURE-BRED HOGS FOR THE MARKET.

BY J. O. HIBBS, VINE GROVE, KY.

The value of thoroughbred swine on the market is of a twofold nature. To the producer it means a lessening of both time and food, two valuable adjuncts for the farmer to combine. Formerly with the ridge-rooters it took from 18 to 24 months to get a pig ready for the market. Now, with increased knowledge and consequently thoroughbred hogs, the pig is ready for the market in from six to eight months, a saving of from 12 to 16 months' time, attention and food. This is of equally as much interest to the consumer as to the grower; they get younger, purer, sweeter meat.

It has been said "the demand creates the supply." In regard to pork and bacon I beg to reverse the axiom and say that pork and bacon will

create the demand. By this I mean the kind, the quality of pork and bacon will increase or decrease the demand. Let a butcher serve his patrons with strong, coarse meats and his customers will soon lose all appetite for such. Let him put young, fresh, sweet, juicy pork on the market and the patrons will buy more and buy oftener. One lamentable fact stands out more prominently than all others, that is, some farmers (with emphasis on some and a soft accent on farmers) send hogs to the market that should not even go to the soap factory for fear that after the addition of lye and a continued boiling some of the disease germs might linger. I doubt, indeed, if they are fit for anything other than a bullet followed by a lime pit. There are farmers who are more anxious for financial gain than personal honor, knowing such hogs cannot pass the inspector, cure these diseased animals as country bacon, thus doing irreparable harm to the honest farmer, to say nothing of the harm done the community.

The twentieth century farmer should breed nothing but the best, feed nothing but the best in order to get the best results. Bear in mind we cannot plug off time, neither can we rest on our oars without drifting down stream. "Time and the tide wait for no man." If we hope to deal creditably with the hog, we must take Father Time by the forelock and with a retrospection of the past and a hope for the future be up and doing in the present. A question might be raised, should all farmers (both little and big) breed thoroughbreds? I claim they should. The little farmer is apt to say, "I raise so few hogs it would not pay me to carry thoroughbreds," to which there can be but one answer, "It does pay." Is there not a sense of satisfaction in looking at even a few good hogs? In addition to this, they feed better, sell better, and a farmer naturally takes better care of thoroughbreds than scrubs. He would not forget to give them salt and hardwood ashes every ten days; he would keep a sharp lookout for vermin, would watch for coughs and feed charred corn to lessen the chance for swine plague.

The farmer in the present and future must needs to cultivate both brain and muscle if he hopes to reach the front rank. He should provide himself with from five to six good agricultural papers, and in the experience of others reap profits unto himself, and thus become a walking encyclopedia of knowledge—a blessing to his own household and a ready help to his neighbors. He should be able to go on an old abandoned farm and with rye, clover and peas, with a little corn with which to finish, with good thoroughbreds and be able to rear hogs by the dozen where originally hogs would not grow at all.

A farmer who carries thoroughbreds soon becomes a noted figure in the community and instead of his having to seek a buyer the buyer seeks him, knowing full well such hogs are always in demand and will top the market.

DEVELOPING BREEDING STOCK.

BY CALDWELL NORTON, LOUISVILLE, KY.

The future usefulness of any young breeding animal depends in a great measure upon its development. To illustrate: I will take a farmer and a breeder living on adjoining farms. Both are corresponding with a breeder of another State in regard to pigs three months old. Price and description satisfactory. Pigs arrived and were up to expectations in every way, and both buyers well pleased. The breeder takes his pig home and, as he is only three months old, puts him in a lot of one acre with six other boar pigs of the same size, with good grass and comfortable house for protection from the weather. This pig is fed on a rich slop made of shipstuff and water, and is given just what he will clean up three times a day, with enough corn and oats to keep in good flesh and at the same time it makes a balanced ration. This pig is kept this way until October 1st, when he is put in a lot to himself and pushed a little faster, as he will have to do service the following months on about five sows, and is fed more so he will not go down hill at a time he should be growing out of pignood into hoghood. When there is a sow to be bred she is brought to his lot, or put in breeding box just outside, and he is taught how to serve either in or out of box. We find the breeder's pig at eight months old in good fix, weighing about 300 pounds, not over-fat, and growing right along. We find him in the same lot next March at one year old, weighing 400 pounds, having had plenty to eat and dry, clean place to sleep all winter. We find him the next March, at two years old, in the same lot in breeding fix, weighing between 600 and 650 pounds, and the sire of 200 stout, healthy pigs. The breeder's pig is just sold for \$150 and is well worth the money because he has proved to be a good sire.

The farmer's pig is taken home and turned in an orchard with a few calves. He is fed more corn than he can eat for about a month, and is also treated to the dish water from the house, but is beginning to show that he misses the good, rich slop that is the only thing that will grow a pig right. By the first of July the pig is forgotten, as the farmer is so busy laying corn by and getting ready to start in his hay. Although the pig is seen on Sundays and the farmer thinks he is not doing well at all, and wonders what is the matter. By the middle of August the apples begin to fall and the pig gets more than he should have, and in another month he looks like he would soon farrow, but there is very little fat on his bones. He, next month, is expected to do service, and is turned in with six old sows and about six gilts and makes a record for himself that would do him credit if he had been three years old, and at this time in

his life is when he is overworked and his usefulness is marred forever. We find him all winter sleeping around a straw stack and being fed his corn in the mud that is about six inches deep. This pig has forgotten a long time ago what slop tastes like, as he has never seen any since he left the home where he was farrowed. We now find the farmer's pig, at one year old, in very thin order, after having only about half he wanted to eat all winter, weighing about 175 pounds, and the farmer is disgusted with him, but should be with himself, as this pig could not grow on only feed enough to keep up animal heat, but the farmer could not see that he had neglected him. Farmer's pig is put in the fattening pen, and the last we see of him he is en route for the stock yard weighing something less than 300 pounds at eighteen months old, and the farmer is fully convinced that it's good money thrown away to invest the same in pedigreed stock.

AMERICAN SWINE.

BY J. R. DODGE, WASHINGTON, D. C.

This country surpasses all others in swine, as in corn, tobacco and cotton. The numbers reported in packing operations are by no means all, though best known and easiest counted. Mr. C. B. Murray keeps a very complete record of these packing operations, and supplies current data relative to hogs killed, meats cut and cured and lard rendered. The United States Treasury takes note of exports of meats from the packers and live hogs from shipping ports. Usually between one-fourth and one-fifth of the total product of the United States is exported, say 22 per cent., and of late about 28 per cent. of the product of packing establishments.

Last year's packing included 22,201,000 hogs in the west, a decrease of 1,450,000 from the previous year, the largest packing record ever made. The total east and west was 28,172,000, against 29,793,000 the previous year. To this should be added, for farm and town slaughtering in the South, and on farms and in villages from the Atlantic coast to the Pacific, probably 12,000,000 more of various weights, but the larger portion small, and averaging about two-thirds as much as the recorded packing, and making fully 20,000,000 hogs slaughtered the past year in the United States.

The record for last year (to March 1, 1900), east and west, is, for green meats made, 3,498,000,000 pounds; lard, 944,000,000; together, 4,442,000,000. To this add 1,200,000,000 for the farm and other killing outside of organized packing, or 5,642,000,000 pounds of product made in the United States.

The value of hogs slaughtered represents a heavy item in farm production. Last year the regular packers paid \$267,858,000 for their hogs.

The farm and other hogs, at an average of \$6.50, would add \$78,000,000, and make an aggregate value of \$345,858,000. Ten years ago the packing record was only \$181,169,000, and though the number of hogs was greater in 1898-99, the aggregate cost of last year's supply was greater than in any previous year.

There is a considerable variation in the cost of hogs, depending on the supply. Last year the cost may be considered nearly an average of \$4.11 per 100 pounds live weight as paid by western packers. In the last decade the average of four years was greater, up to \$5.87 in 1893-94, and former years less, down to \$3.30 in 1896-97. The cost averaged a little higher in the previous decade, ranging in the several years from \$6.65 in 1882-83 down to \$3.75 in 1884-85, lower than \$4 only two years, while in the past ten years the average was below that figure four years. The following is a statement of average cost:

<i>Seasons.</i>	<i>Summer.</i>	<i>Winter.</i>	<i>Year.</i>
1890-91	\$3 91	\$3 54	\$3 74
1891-92	4 48	3 91	4 16
1892-93	5 03	6 54	5 60
1893-94	6 33	5 26	5 87
1894-95	4 98	4 28	4 67
1895-96	4 41	3 68	4 07
1896-97	3 30	3 30	3 30
1897-98	3 70	3 53	3 63
1898-99	3 85	3 52	3 71
1899-00	4 00	4 29	4 11

The weight of hogs slaughtered averaged less than in earlier seasons of pork packing. From 1873 to 1890, inclusive, the average weight was less than 250, only in 1888, ranging from 290.53, in 1873 to 251.31 in 1887. Since the highest average was 278.20, in 1894, and the lowest 232.65 in 1899.

Hogs are killed at an earlier age than formerly. Fewer are kept over winter and the tendency is to better care and feeding, more continuous and early fattening, in accordance with the ruling economics of meat making in all lines.

EXERCISE.

It is important that the pigs have a clean, dry bed and plenty of exercise. Whenever the weather permits they should be induced to stir out. Failure to take exercise is the one great hindrance to success in raising pigs in very cold weather. They burrow in their nests and remain inactive until thumps destroy them.

YOUNG OR OLD SOWS FOR BREEDERS.

BY SAM CLARK.

Much has been said and written about the comparative merits of young and old sows for breeding purposes. I tried to breed up my herd in this manner: If I had forty brood sows and desired to retain the same number for the next year's breeding I would carefully watch each sow with her litter as a mother, nurse and suckler, and just before the pigs were weaned I would discard the twenty sows which had raised me the twenty poorest litters. No matter how fine a show animal a sow might be, if she raised a poor litter she had to go, unless I specially desired her for the show ring, and then she is pretty sure to get me into trouble, as I must explain why her pigs are not with her, or, if on exhibition, why they are no better. As a matter of policy, as well as finance, it were better to dispose of her, paying no attention to age.

The sow that raises the best litter of pigs, I retain, no matter if she is five or ten years old; so long as she raises my best litter of pigs she is my best brood sow and I will not discard her for a green, untried one. Now to replace the twenty sows I have discarded and turned into pork, I would take twenty sow pigs from the best sow, being careful to select them from litters of six to ten and all of the pigs in the litter good ones. If a sow had eight or ten pigs and only one or two of the litter good, I would not select breeders from such a litter, although that one or two might be among the very best specimens in the whole herd.

RAPE FOR SWINE FEEDING.

Rape is fast coming to the front as a profitable crop to grow for swine pasture. Every farmer should know how to grow this crop, and give it a trial. Rape may be sown any time from early spring until the first of August, and is ready for use from eight to ten weeks after the seed is sown. The seed may be sown with oats or barley, or it may be sown by itself. If with the former, let the oats appear above ground, and then sow on two or three pounds of rape seed and cover lightly with a harrow. The dragging will not kill the oats, and will cover the rape seed. The rape starting after the oats will grow spindling because shaded. If sown at the same time the rape grows as fast as the oats and makes trouble in harvesting. When the oats are cut the rape will spring forward and furnish feed. Another way is to sow the rape seed by itself broadcast on

well prepared ground. A third way is to drill in the seed the same as rutabaga turnips, having the rows thirty inches apart and cultivating with a one-horse cultivator. Rape so seeded need not be thinned. By sowing early, rape will be ready for pigs by the middle of June, while the latest sowing will furnish feed from the first of October until the ground is frozen solid. It should be remembered that the rape plant stores its nourishment in the leaves which resemble the leaves of the rutabaga turnip, only they are larger, more numerous and more nutritious. Rape cannot be used for making hay, silage or for any such purpose—it should be fed off on the ground by stock or cut and carried to them. While rape is primarily a sheep feed, it serves about equally well for pigs. Every farmer should have a rape patch, if only half an acre in area, for his pigs. Provide an acre of rape for each 2,500 pounds of growing pigs, to be fed upon that crop. As soon as the rape plants are a foot high, turn in the pigs to feed upon them. They will greedily eat the leaves and gain about enough nourishment therefrom to support their bodies. This true, all of the extra feed will go for gain. Corn, middlings, etc., should be fed with the rape. A great advantage of rape feeding is that it keeps the digestive tract expanded and in healthful condition. Pigs fed rape fatten quickly and very cheaply. Farmers should take extra precautions to sow none but the Dwarf Essex rape seed, which costs not over 10 cents per pound if ordered in quantity. In many cases farmers have bought oil rape seed or bird seed rape, and the crop proved a failure. Be sure to order Dwarf Essex rape seed. Sow two to three pounds per acre when drilled, and four or five pounds when broadcasted. Every pig-raiser who has not yet tried rape is urged to do so the present season. Our experiment stations were the main source of introducing rape into this country, and they have paid for themselves in what they have done in helping our farmers to this one crop.

SLEEPING QUARTERS FOR SWINE.

It is better for the hogs for them to sleep in the fence corners or in the beds of leaves and brush on the south side of a big log in the woods than breathe dust and trash under the corn crib, where, if permitted, they invariably seek sleeping quarters. Whether the cholera germ is invigorated or given better opportunity for its development by its victims sleeping in a place where fine dust and trash are several inches deep may be doubted by some, but we have it from an old swine breeder, who says fine dust in the sleeping quarters of hogs aids the germ considerably in getting a grip on the animals. While the hog is an unclean brute and seems to delight in wallowing in mud and eating offensive stuff, we be-

lieve this proclivity has been bred into him by stockmen, who, thinking him naturally filthy, permit, if not compel, their hogs to occupy any little pen or bare pasture or lot, excusing the case by saying, "any place is good enough for a hog."

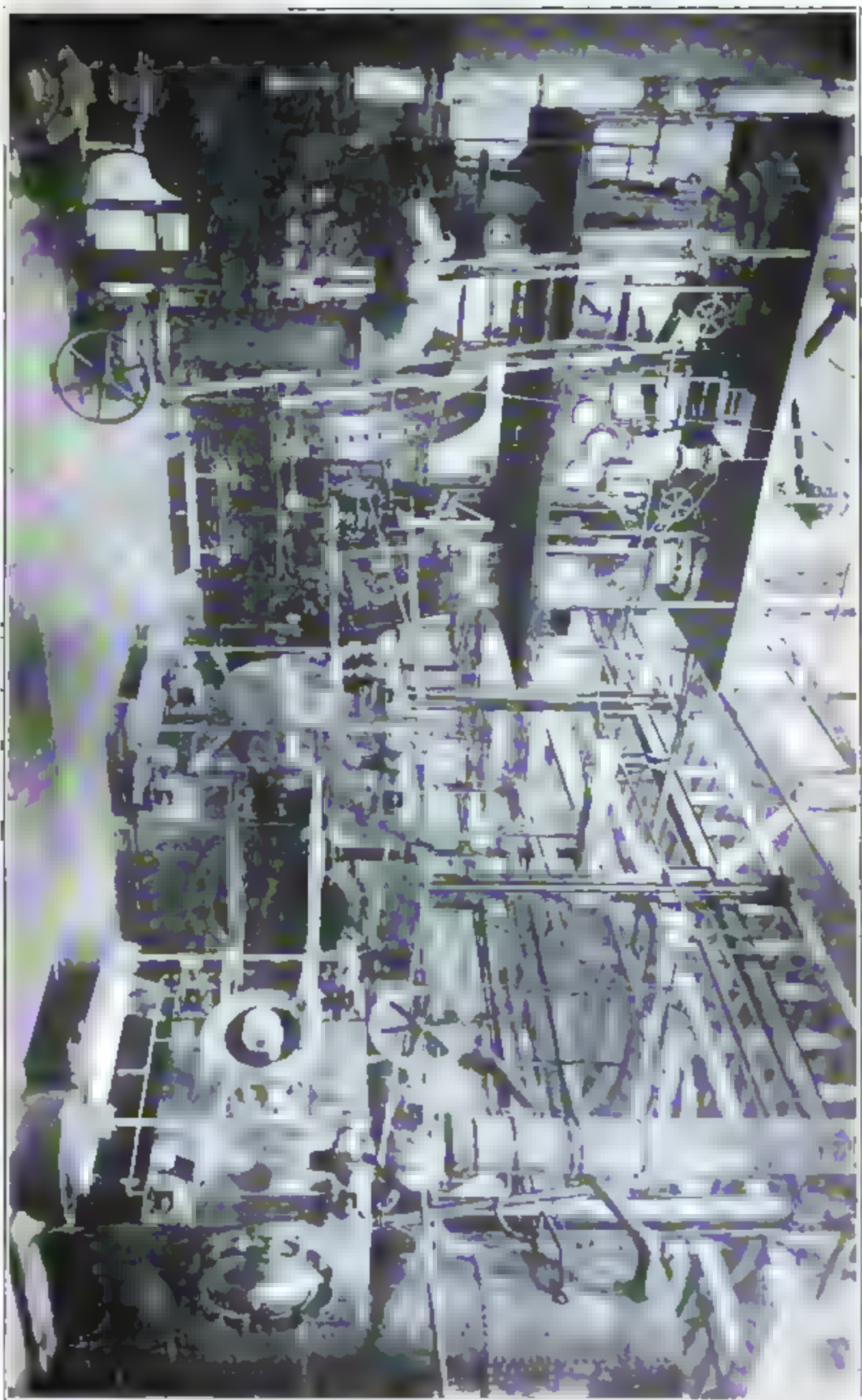
By the same process that has made the hog such an unclean brute we believe he can be improved in his regard for self-cleanliness and decency, though we do not expect him ever to become so fastidious as a pug dog. But by keeping the hogs in grassy pastures, providing thickly bedded sleeping quarters for them, giving feed in clean troughs, access to plenty of clean, fresh water and using the best boars, a very perceptible reformation will result. The health and vigor, however, of the herd will depend to a very large extent upon the sanitation of their sleeping quarters, where much of their time is spent. Where foul odors abound and the wind keeps the air laden with fine dust, each hog breathing the breath of another, there is likely to arise disease of some kind—and too frequently it happens to be cholera.

WHAT BECOMES OF THE HOG WHEN IT REACHES THE PACKING-HOUSE.

There is probably no industry which better illustrates the economy of thorough organization, both in the saving of labor and in utilizing the whole product than that of packing.

The difference between the method of slaughtering from five to seven hogs on the farm, where it requires the whole of one day and the labor of three or four people to get it into the desired form, and the method used in handling as many thousand per day in one of the large packing houses is so great that it can scarcely be comprehended by the ordinary person. There is probably no large business in which every detail is better mastered so that the following of the pig from the closing of the gate through all the stages of the making of a food product to the placing of the shipping tag is interesting and profitable.

The pig enters the slaughter house near the top and is received with about forty or fifty companions in a small pen. On the side of the pen is a large wheel from the rim of which is attached several chains with hooks. The pig-catcher seizes the pig by a hind leg and places a special chain above the hough and hitches it in one of the chains on the wheel. The wheel is in constant motion and as it turns lifts the hog high in the air and easily places the pig on an inclined rail and sends him on his way to the sticker. Thus one after another they follow in quick succession. As the pigs pass the sticker they are killed by a single thrust of the knife and from this moment nothing is lost. Even the squeal has



KINGAN'S REFRIGERATING PLANT.
200-TON ICE MACHINE, COMPRESSOR TYPE. CYLINDERS, 22 $\frac{1}{2}$ IN. STEAM CYLINDERS: HIGH PRESSURE, 23X36 IN.; LOW PRESSURE, 40X36 IN.
FLY WHEEL, 32,000 POUNDS.

been caught on the phonograph and turned into commercial use. Some stickers are so dextrous that no squeal ever occurs after they once seize them. The rate of the movement is checked slightly in order to save all the blood and to give them time to die before reaching the scalding vat. The pig is dropped easily into the scalding vat and again seized by an endless chain bearing heavy prongs and turned over and dragged to the opposite end. The vat is about twenty feet long, and upon reaching the end he is lifted out by a large cradle. Men watch the course to see that the water remains at the proper temperature and to tell when the scalding is done. Upon being lifted out he is again attached to an endless chain that drags him through the scraping machine. The scraper is built like a barrel and has a large number of scrapers mounted on springs projecting from the inside. These scrapers can accommodate themselves to any sized hog or any irregularity of the body so that the hog is almost clean when he reaches the opposite end. A little hair may be left upon the face, ears and feet to be removed by hand. The scraping machine may be horizontal or upright, but in either position the hog receives a copious volume of water to wash away the hair. The hog comes from the scraping machine upon the scraping table where a few men complete the work as nearly as possible while the gambrel is being put in position.

The hog once more starts on a journey and the first place he meets a bath of soda water and a man with a stiff brush to clean any dark-colored patches so as to make the whole carcass look uniform. During this time he is seized and the head half severed from the body. A few feet farther along he meets the gutter, who with one stroke of the knife splits open the hog along the entire length of the body. With two or three more thrusts he releases the intestines to the diaphragm. The next man is known as the snatcher and he seizes the intestines and with one or two movements completely separates the diaphragm and then completes his job by loosening the heart and lungs. How speedily this work is accomplished can only be realized when it is known that three men will handle from five to six thousand hogs in a day. They are about the best paid men in the plant. During the removal of all organs the whole operation is under the eye of a United States inspector who stands behind and above them.

The hog passes on to the next man who turns on a stream of water and sluices out the body. If any remnant of a piece of trachea should remain he removes it. Two or three scrapers are then ready to receive it and shave off any hairs that may have escaped up to this time, and the last man cuts off the teats from sows and the carcass is ready for a bath. The hog moves on and is weighed, and here is the first stop that he takes on his course to the cooling room. The head is then removed and the next gentleman awaiting his arrival is known as the ham facer. He is an expert and decides what kind of ham he is best adapted to make. The weight and size of the hog are large determining factors whether the ham will be faced or not. The next man is the leaf puller and he



KINGAN'S REFRIGERATING PLANT.
ICE MAKING—TWO ROOMS, EACH FIFTY TONS.

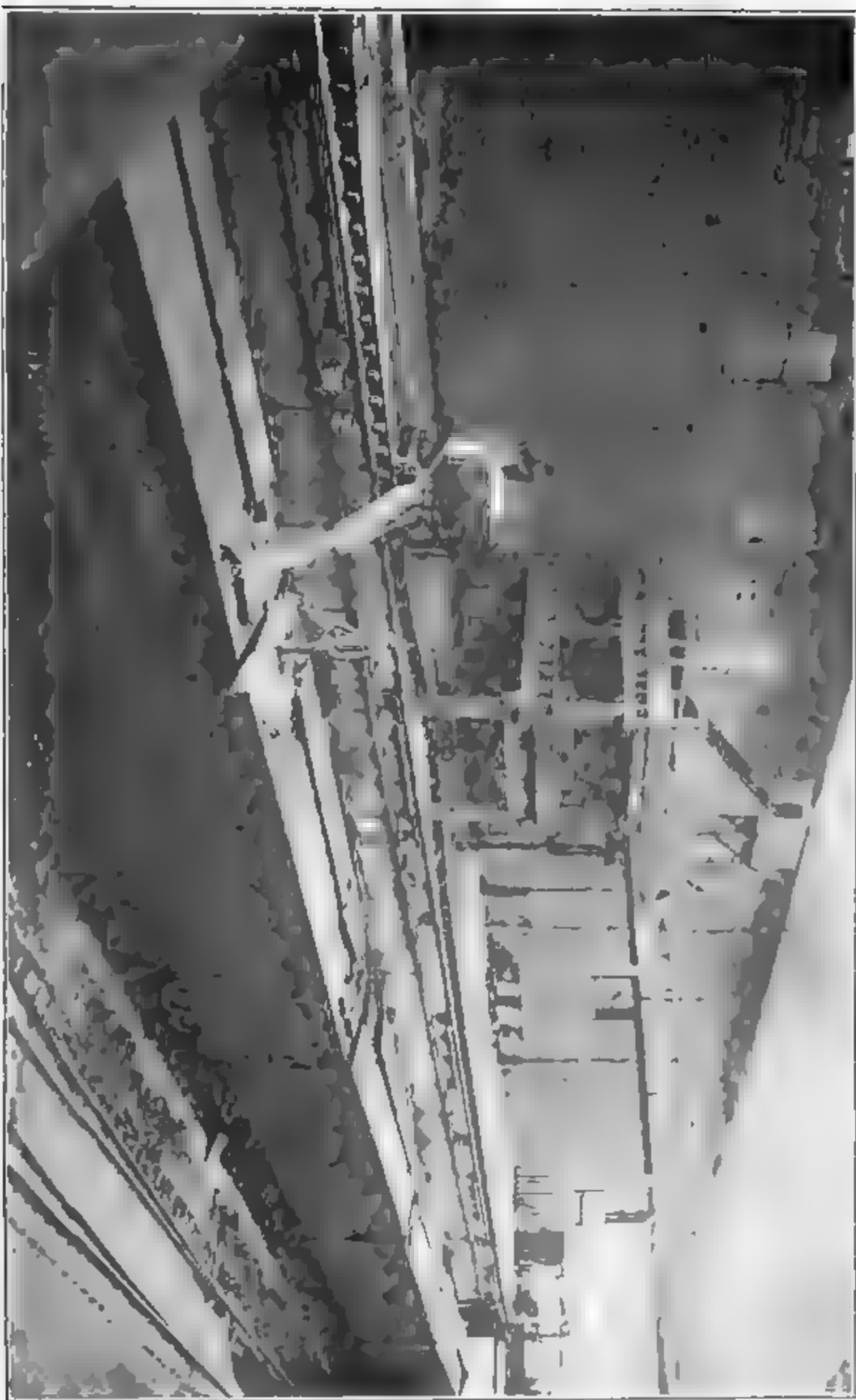
removes the clear fat or leaf lard. At the same time the kidneys are taken out.

One or two experts are now waiting to determine how the carcass shall be divided—whether the back bone shall be split or shall be removed. If they decide that the back bone shall be split the hog goes on directly to the splitter, but if it is to be removed they make a cut from tail to neck on each side of the middle line of the back and the hog goes on to the splitter. The splitters must be able to do their work with great precision, and some are able with only a few blows to exactly divide the spinal marrow throughout its entire length. The last man to be encountered on the way to the cooling room is a scraper, and it is his business to remove all tags and pieces of fat and save the same for lard. One of the objects is to make the carcass appear well.

The hogs intended for microscopic examination are not entirely split; the head may or may not be removed and the leaf lard is left in position.

Hogs that are condemned never have the backs removed but are thrown out entire. On leaving the killing floor for the cooling room the gambrel (which is complicated) drops and leaves each half on a separate track. The time occupied for all this from the penning to the cooling room is about ten minutes.

The hanging room has the same temperature as the outside air, and the hogs remain there only such time as the weather will permit, but the object is to get rid of the animal heat. The pig is moved on to the chilling room and here he remains from twenty-four to forty-eight hours. The temperature is held at from thirty-six degrees to forty-four degrees Fahrenheit. The next place he reaches is the cutting room and here he is disposed of with the same speed as has moved up to this point. The ribs are removed with huge curved draw knife; bones are either cut off with one stroke of a cleaver or sawed off on a band saw. The different packers have different names for the same cut, but they are in general, regular hams, long-cut hams, regular shoulders, the boneless ham, which is a shoulder with the bones removed, the picnics or California hams, which are shoulders cut like hams; boneless plates, salt butts, or butt cuts, which come from the neck; fat backs, the fat from the back with the loin removed; long clear middles, short clear middles, Stafford middles, or middles with the ribs left in; clear belly or bacon, loins and tenderloins, and Cumberland cut, or a half hog with the ham, shoulder blade and humerus removed and feet cut off. The backs make the joints, the tail and the last few joints go into the lard; the feet go for pickle, for pigs feet jelly, and into glue; the knuckles go to the canning factory; the trimmings go into lard and sausage; the cut stuffs go to the cellar as dry salt or sweet pickle. Each packer has his own formula for preserving and these are kept secret.



KINGAN'S REFRIGERATING PLANT.
LOADING ICE IN REFRIGERATOR CARS TO LONDON GATE TRAINS OF MEAT.

Most of the stuff must remain in the cellar from sixty to ninety days, depending upon the season. During the winter the meats may be shipped much greener than in summer. These meats must be moved very often and the changing of the acres of meat in order that it shall cure properly is one of the very large labor problems about the place. Some of the hams, shoulders and bacon are smoked, and this requires an immense amount of work. All meat before being packed for shipment is tested by an expert who forces a sharp-pointed instrument into the center of the piece and then smells of it.

To return again to the part of the pig left along the way. The blood is all saved and from it are made albumen now largely used by bakeries, buttons, and fertilizer. It is one of the principal sources of nitrogen for the commercial fertilizers. The hairs are saved, the bristles saved for brushes and the other hair broken and split for mortar.

The intestines, with the liver, heart and lungs, have found their way to the table; the liver, heart and lungs are separated; the intestines are "run," separating all the fat; the stomach is saved for large sausages and the small intestines cleaned for small or link sausages. The large intestines are split open and the contents cleaned and thrown in the rendering tank. From the stomach rennet is obtained and pepsin made. The pancreas furnishes the sweetbreads and pancreatin. The suprarenal capsules furnish suprarenal extract. The bladders are saved for putty. The spleen goes into fertilizer. The livers are only saved in part for shipment, some are used in puddings and the balance go for fertilizer. The fat about the heart and lungs is stripped; the heart is made into sausage and the remainder goes into the rendering tank. The head is not a very valuable part; the jowl is opened and the lean removed to make sausage; the tongues go to the canner, some are pickled and some into sausage. The balance of the head goes to the lard tank.

Lard is designated in the market as prime clear, pure leaf, open kettle, rendered, etc. The rendering tanks also yield white grease and black grease and from this machine oils, soap grease, etc., is derived. The cracklings from the lard press are ground up and make meat meal for dogs and stock. The other cracklings, bones, etc., go into fertilizer.

Very little pork goes into sausage. The main part of the meat used in sausage is beef with only sufficient pork to give flavor.

A considerable amount of fat is also used in the butterine with the beef fat.



KINGAN'S KILLING DEPARTMENT.
Hoe-Hanging Room for 8,000 Hoes.

25—AGRI.

(385)



МИНИСТЕРСТВО ВНЕШНИХ ДЕЛ
 МИНИСТЕРСТВО ВНЕШНИХ ДЕЛ, МИНИСТЕРСТВО ВНЕШНИХ ДЕЛ



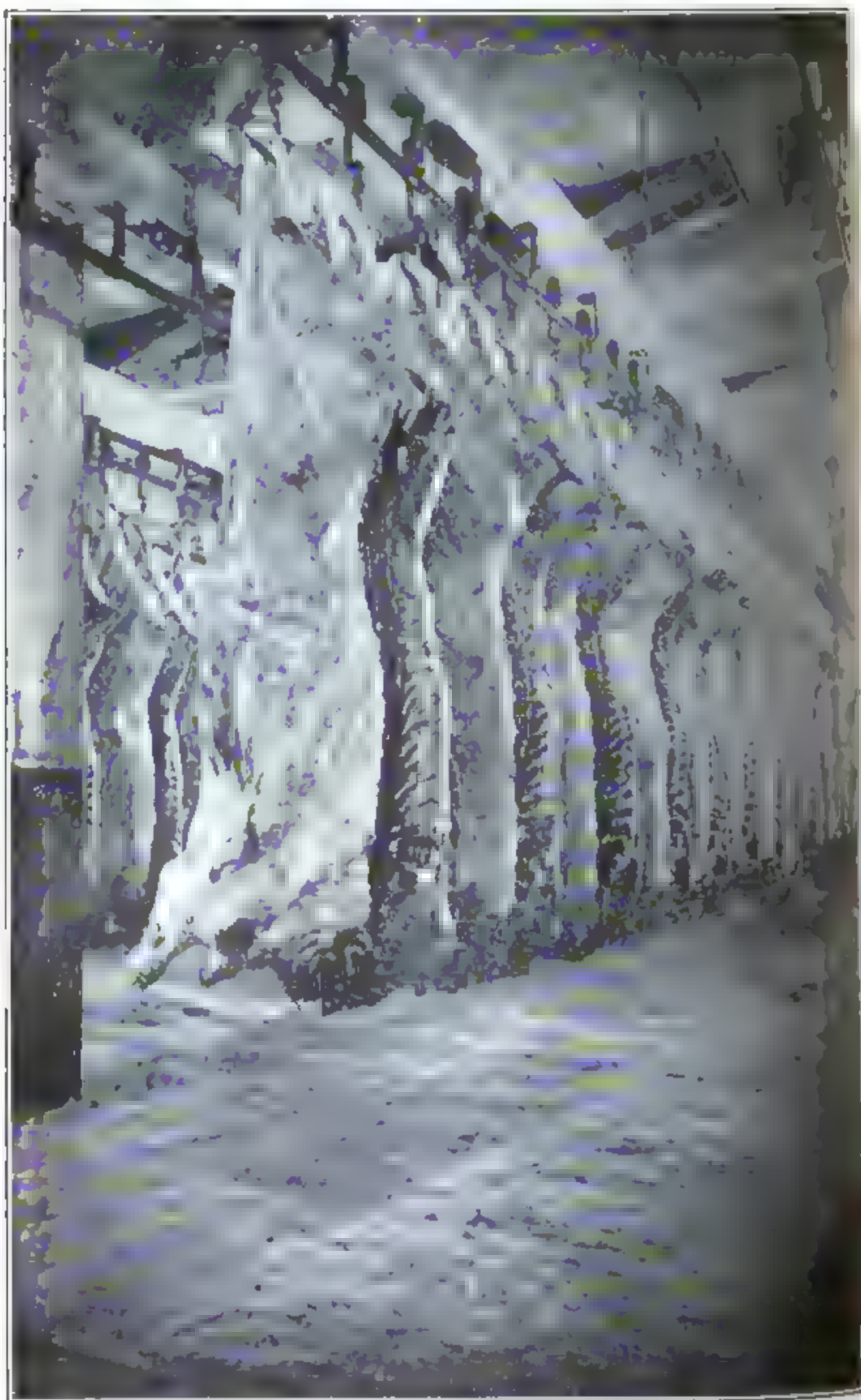
KINGAN'S LARD DEPARTMENT.
FILLING LARD TUBS.



WISCONSIN LAND DEPARTMENT



KINGAN'S CURING DEPARTMENT.
SALTING MEAT.



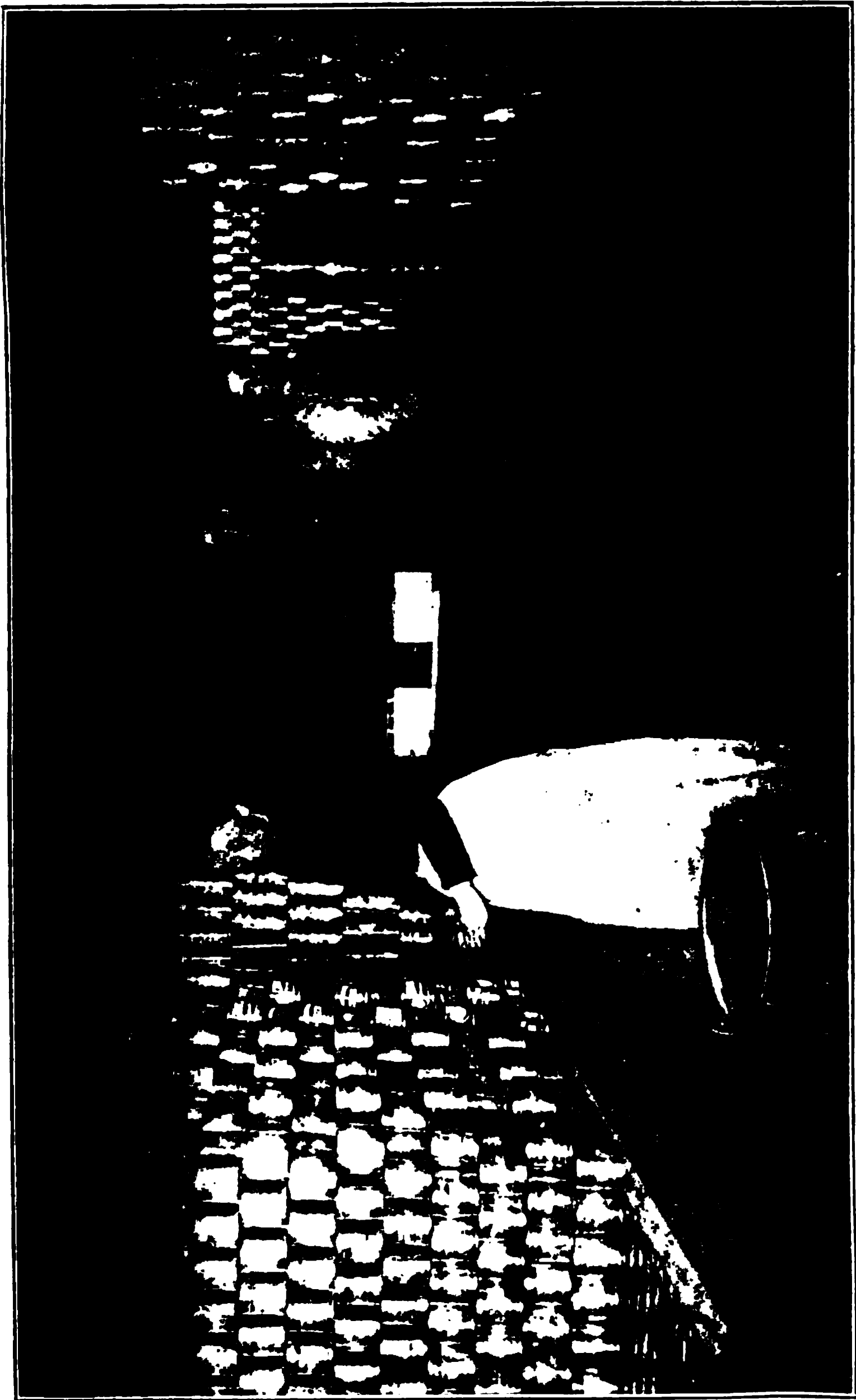
KINGAN'S BEEF DEPARTMENT.
BEEF COOLING ROOM—CAPACITY, 1,000 HEAD.
(300)



KINGAN'S CANNING DEPARTMENT.
PREPARING TONGUES.



KINGAN'S CANNING DEPARTMENT.
MAKING CLAMS



KINGAN'S CANNING DEPARTMENT.
LABELING ROOM.



WINGAN'S BUTTERINE DEPARTMENT.
BUTTERINE COOKER, PACKING ROOM.



KINGAN'S SAUSAGE DEPARTMENT.
SAUSAGE MEAT CUTTERS.



KINGMAN'S CARPENTRY CLEANING DEPARTMENT.



KINGAN'S JOBBING-HOUSE YARD.

TWENTY-FIFTH ANNUAL CONVENTION

OF THE

Indiana Wool Growers' Association.

CONVENED AT ROOM 11, STATE HOUSE.

First session called to order by the President, W. A. Guthrie, at 1:30 o'clock, January 2, 1900.

PRESIDENT'S ADDRESS.

Gentlemen of the Indiana Wool Growers' Association:

It is a pleasure to greet you, and an honor to officiate at your twenty-fifth annual meeting. The object of the Association is to strengthen an art; to obtain something practical thereto; to learn of certain morbid states and to recognize healthy conditions; to note relative advancements or retrogressions; to generate an enthusiasm for the cause; to compare, and in consequence, to make our work a pleasure and a profit.

We recognize the closing year as one of industrial growth and prosperous advancement for sheep husbandry. Statistics prove we are making an advance in Indiana. Our report for May 1, 1898, recorded 747,878 sheep, 507,861 lambs, giving a total of 1,255,739; while for April 1, 1899, we find 861,024 sheep and 459,097 lambs, giving a total of 1,320,121; consequently we have a gain of 64,382 in our State. We also had 5,437 less killed by dogs, showing what our society has scored in promulgating the present dog law.

Following the McKinley tariff of 1890, the sheep industry of the United States increased in round numbers from 42,000,000, valued at \$47,000,000, to 90,000,000, valued at \$125,000,000, a total gain of 48,000,000 sheep, and \$78,000,000.

Under the Wilson bill of 1894, up to 1897, when our present law was enacted, the number of sheep was reduced to 36,000,000, valued at \$67,000,000. From January 1, 1897, to January 1, 1899, sheep increased to 39,000,000 in number, valued at \$107,000,000. A discussion of the tariff is not demanded. With the present administration we are encouraged to continue sheep raising. I have seen a statement that the total wool pro-

duction of the United States has fallen off in the past six years more than 76,000,000 pounds. With wool advancing, and short supply, and an increased demand for mutton, sheep husbandry will certainly be more profitable than it has been for years.

Our climate and soil are such that we are able to grow the majority of the breeds with successful results, and in consequence, choose for the market according to our fancy. Fitz-Herbert once said, "Sheep are the most profitable cattle a man can raise," but we fear many of our counties do not concur in this opinion. Indeed, we find in the southern portions of our State, which are very favorable for the industry, comparatively few sheep. The northeastern portions of the State furnish the greatest number of sheep for our markets. We must accord Steuben County, with her 45,252 sheep, the banner. Kosciusko has 44,991; Noble, 43,151; Lagrange, 41,619; Montgomery, 37,330; Allen, 29,562; Marshall, 28,314; Wabash, 28,184; Dekalb, 26,455; Fulton, 27,075; Whitley, 25,334; Elkhart, 25,318; Cass, 24,673; Grant, 24,994; Jay, 23,952; Adams, 23,611; Fountain, 21,895; Parke, 21,044; Wells, 20,840; Owen, 20,526, with about half of our State with less than 10,000, Vanderburgh having the smallest number, it being less than one thousand.

The prospects for a marked revival of this industry are favorable. With our modern stock yards and the increased demand, our market is ranking as one of the best in the West. Indeed, the sheep business is like other pursuits, in order to give a luster of success we must intensify an interest in it, look well after details, acquire the several bits of information necessary, and above all, exercise common sense.

A motion was made and carried that a committee of three be appointed to consider the President's address, and to report on it at a future meeting.

Committee on President's Address—Messrs. Quick, Privett and Cowgill.

The report of the Treasurer was then called for, and Mr. J. L. Thompson submitted the following:

TREASURER'S REPORT.

<i>Income</i>	
Receipts since last meeting.....	\$7 50
Cash on hand at last meeting.....	9 44
	----- \$16 94
<i>Expenditures</i>	
For postage.....	\$5 30
For stenographer.....	8 00
	----- 13 30
Balance on hand.....	\$3 64

The report was received and accepted.

The Legislative Committee, Mr. Quick, Chairman, then reported as follows:

There was no little amount of work done by this committee. We made six or eight trips to the city on account of it, but while we thought we were doing the proper thing we perhaps made some mistakes. We were working earnestly and honestly for the cause of sheep husbandry, but we allowed two different matters to come together in one bill, and it may have had a bad influence on the measure we wished passed. Your President, Mr. Guthrie, Dr. Bitting and several others, helped us, and we did everything in our power for the passage of the bill to compel the dipping of sheep at the stock yards, not allowing any sheep to leave there that were not dipped. I do not think we should give up the matter. One of the greatest menaces we have to sheep husbandry is the sheep scab. It is a very troublesome and expensive thing to eradicate, and it causes sheep raisers untold loss in sheep and in wool if it is allowed to go far. We did all we could to get this bill passed last winter. Senator Guthrie's efforts were untiring, and the committee were always ready to come whenever he notified them. We never knew when the matter was to come up. We regret to make the report that our efforts resulted in failure. However, we feel that we did a great deal of good, and our efforts were the cause of much more care being taken at our stock yards than was ever taken there before.

President Guthrie: The mistake was made of coupling this bill to compel the dipping of sheep at our stock yards with another bill. It was not the opposition to dipping sheep at the stock yards, but opposition to the other part of it that defeated the bill. I was taken ill about the time it should have come up and it failed to pass. I think we can promise you that this bill will become a law next winter.

The program was then taken up, and Miss Anna Matthews was introduced, who read the following address on—

THE SHEPHERDS OF ANTIQUITY.

MISS ANNA MATTHEWS, BROOKLYN, IND.

I have been asked to prepare and read a paper before this assembly, and have taken for my subject, "The Shepherds of Antiquity," and have undertaken the task almost without hope of performing it with satisfaction to myself or profit to those who may hear me.

Sometimes a dinner is more palatable by having an odd dish on the menu, and it may be that a spice of thought along with the regular diet of tariff, dogs, lice, worms, long wool, short wool, and a dozen other sub-

jects too tedious to mention, may help out the dinner of a wool growers' meeting. If so, I shall not have toiled in vain.

The origin of the sheep and its shepherd is unknown, but the pages of history tell us that the bleating of the lamb, the tinkle of its bell and the note of the shepherd's reed have been heard on the sun-kissed hills and radiant valleys from silver dawn and golden noon to dewy evening for countless ages. The shepherd's enterprise is one that is inseparably welded with the art of sheep raising, and has stood and will stand with a firmness that is ironclad till the Divine command tells man to surrender all that is earthly. We find the son of the first created man a shepherd, and from that day to this, in all lands, the lamb is adopted as an emblem of patience and a symbol of purity in Christian belief.

I offer you here a few pictures of ancient shepherds, as they occur to me at a glance, and I have endeavored to let the shepherd and his flocks take the foreground in each picture, and as secondary, some of the vicissitudes and environments with which they were surrounded. My first picture is taken when the first morning rays of a tropical sun are casting long shadows in the valleys and tipping the hills with rose and gold that met and mingled with the reflected rose and gold in the waters of the Euphrates River that peacefully slept in the valley on the eastern side of Eden. To the north, earth's loftiest range stretches out as far as the eye can scan, clothed in the vesture of every season. Tropical plants and flora are at its feet, and upon its brow pinacles of snow and ice lift themselves to bluest skies. To the west there flashes up at intervals a strange but ominous light seen at no other time of day. It is the leveled rays of the sun reflected from the dread barricade of Eden, the sword of God's wrath, turning every way and waving out its warning in the morning air that is filled with the song of birds, the perfume of blossoming flowers, the lowing of cattle and the bleating of the flock of sheep.

In the midst of this, a little band of weary exiles have pitched their tent. Two of these exiles are looking back with sorrowing faces, turned toward the weird flashes in the west which warn them against a return to the home of youth and happiness. Two sturdy young men are busy about the preparations of the morning sacrifice. Heaped upon one altar are the choicest fruits of field and vine; upon another is the bleeding form of a lamb, "a firstling of the flock." Each worshiper has brought to this sacrifice the best that his ingenuity could afford, the fruits of honest toil and the pride of husbandman and shepherd. The torch is applied, and the worshipers prostrate themselves in anticipation of divine sanction, while two columns of smoke lose themselves amid the upper air. A listening Jehovah, for whom these offerings were offered, was pleased with the sight of the bleeding lamb and the perfume of its burning flesh, blood and wool; but held in disdain the incense of fruit and grain. So here in this primitive temple, whose floor was the unswept earth and whose roof was the skies, the Almighty proclaimed and set the seal of

Heaven's approval upon the shepherd and his craft. But to what did this Divine preference lead? Did it bring to Cain's mind the thought of home, love and kindred? No, it was the child of thought that led to the first jealousy, hatred, murder! These three elements were the predominating ones of the day, until sixteen centuries have rolled away since the tragedy of Eden. Fourteen generations of God's noblest creation have testified to their gratitude for existence by acts of immorality, impiety, indecency and rebellion. The God who walked in Eden is disgusted with his handiwork. His stock in humanity is at such discount that he has resolved to water it. Centuries of meditation have brought him to the set purpose of total destruction, notwithstanding the dire consequences to his favored vocation. It is the season of springing flowers and grasses. Earth is putting on her choicest vesture. The sons of Lamech and Methuselah are watching their flocks on the hills and in the valleys of Ararat, where the green carpet of vegetation furnishes pasture to flocks without number.

Torrental rains send the brooks and rills foaming down the hillsides into the river, already swollen by the rising tide, into a brackish lake. The sun is hidden behind a shroud of clouds. Day after day, and night after night, increasing cloud bursts deluge the lower country. The denizens of the valleys gather together their household trappings and their flocks and mount the hills through drenching showers of rain. The shores of hillsides abound in wreckage of homes and the carcasses of animals and man, already swallowed up in the rising tide.

The tableland of Ararat is made the fold for such flocks and herds as earth had never before seen and never shall again. The tinkle of bells and the bleat of lambs is mingled with the roar of savage beasts, the snort of prancing horses, the chatter of monkeys, the shrieks of terrified women, the cries of helpless children, the hoarse shouts of excited men and the crash of the elements. A day of darkness is followed by a night of terror. The tide has risen until the highest point of ground is submerged. One mighty wave of ocean comes sweeping in and a hideous flash of God's wrathful lightning reveals the last of earth's fauna struggling for life amid the whitecaps of ocean.

I turn from it. A brilliant sun breaks through the blanket of clouds and dispels the fogs and mists of months, and looks out on a world of water. The greatest craft ever borne on ocean's breast heaves in sight. A bark with neither wheel nor sail, keel nor rudder; a vessel without captain or pilot, anchor or compass, but freighted with the survivors of earth's grandest and greatest catastrophe. The original menagerie is on board. A cruise of five months is drawing to a close. A wreck marks the end as it does the end of each and all. The vessel lands high and dry in the mountains of Ararat. The waters recede. Earth strewn with wreckage, and the bones of animals and man are whitening in the sun. After a confinement of a year the gang-plank is lowered and soon the bark is tenantless. A little flock of seven sheep came down the mountain side

•

in the parade of escaping animals. One is chosen for the offering, and again the smoke and perfume of sacrifice mounts the sky to meet the eye and nostril of Jehovah, while a bow of promise spans the heavens.

The next picture is found where the Jabbok tumbles down its precipitous and wandering course, now spreading out into small lakes among the hills, and now tumbling over some ledge of stone and babbling on toward the Dead Sea, to which it pays the tribute of its waters from the plain of Padan Aram. Its banks at intervals are skirted by groves of figs and olives, which furnish shelter from the burning rays of a tropic sun. The traveler and his flocks find shelter and water here. All day flock after flock of sheep and goats, and herd after herd of cattle and asses have arrived and taken shelter on the west side of Jabbok. One of earth's greatest shepherds and breeders, with his flocks and herds and servants and family, the booty of a twenty-years' campaign, has gone into camp.

Their march has been long and toilsome and beset by many dangers. The old patriarch has made successful exit from the land of his uncle. The treaty of Mount Gilead stands between him and the wrath of his aged and wronged relative. Flocks and herds without number have accumulated under skillful management and careful breeding. The doctrine of birthmarks has been practiced in breeding, to the utter ruin of his father-in-law. The skinned sapling has been dextrously used until the whole flock has become "ring-streaked, speckled and spotted."

The glory of a large family is his. Fourteen years have given him two wives, two concubines, eleven sons, and one daughter. The time is at hand for him to return to the land of his father, and he longs to behold again the home of his childhood. The journey is almost completed, but a new danger presents itself. As memory reverts to his father's plantation, a hard-driven bargain of his younger days comes to mind. He remembers his famishing brother and the fraudulent treaty by which his brother surrendered his greatest right. He remembers, too, his treachery to his old blind father whose head was hoary white; a treachery which can not be excused as one of the follies of youth, a treachery deliberately planned and maliciously executed in mature years. Pondering over these, the question arises, "What will his reception be?" A halt is called at the Jabbok, and messengers are sent to announce his return. Days and nights succeed each other—days of terror, nights of fear and anxiety. Eager eyes are constantly turned to the northwest where sky and plain seem to meet. At length a cry is sounded in the camp. "The camels are coming!" And as they approach nearer and nearer they are seen to be the camels of Reuben. And what a message! "Esau cometh with four hundred." A hurried council. Herds and flocks are corralled, and a princely gift is assorted among them. A peace offering of hundreds of the choicest sheep, goats, cattle, asses and camels are started in separate droves to follow each other into the camp of Esau, with messages of conciliation and peace. The flocks and herds and servants are divided

into two bands, and instructions are given for either band to fly if the other is assailed. The family of women and children are taken across the Jabbok to the heights for greater safety. Night succeeds day, and the struggling moonbeams fall upon the herd of Bethel and Mount Gilead prostrate in prayer.

And Jacob said: "Ah, God of my father Abraham, and God of my father Isaac, the Lord which saidst unto me, return into thy country and to thy kindred and I will deal well with thee. I am not worthy of the least of all the mercies and of all the truth which thou hast shewed unto thy servant, for with my staff I passed over this Jordan and now I am become two bands. Deliver me, I pray thee, from the hand of Esau, for I fear him lest he will come and smite me and the mother with the children. And thou saidst, I will surely do thee good and make thy seed as the sand of the sea, which can not be numbered for multitude." The night is spent in prayer and wrestling. Esau comes forth to meet his brother. They fall together in tears. The family of Jacob come from beyond the Jabbok and prostrate themselves about their new-found uncle. Jacob's present is reluctantly accepted, but the yoke of dominion is broken from the neck of Esau.

The sun is setting on a brief December day. A pale old moon struggles to keep the waning day but ere long is lost like the sun behind the hill ranges of Judea. Twilight is succeeded by night—a night made typical by a diamond-studded sky. Flocks have been gathered into a temporary corral, and the shepherds promise themselves a night of rest and repose. The sentry of the second watch is on duty and is closely scanning a star whose position at a certain hour marks the end of his vigils. His measured tread about the corral mingles with an occasional tinkle of a bell. It is the hour of midnight, and the end of the watch. The sentry arouses his slumbering colleague, who is to take the third watch. While yet they exchange midnight greeting, a sudden flash of mysterious light brings all about them into view. They set up the cry, "Awake! Awake! A light!" Immediately the whole corral, shepherds, sheep and dogs are on their feet; the dogs bay with fright, the sheep rush madly about the wall, seeking egress. The shepherds stand awe struck, gazing skyward in amazement, wonder and alarm. As the light increases in brilliancy, faint sounds of music seem to fall from some dizzy height. A voice speaks from the sky: "Fear not, for behold I bring you good tidings of great joy which shall be to all people. For unto you is born a Savior, which is Christ, the Lord. And this shall be a sign unto you, Ye shall find a babe wrapped in swaddling clothes lying in a manger." The voice ceases, and the refrain of angels is audible.

"Glory to God in the highest, and on earth peace, good will toward men."

Silence and darkness succeed the wonder. God has again expressed Divine preference for the shepherd and his craft in making him the vehi-

cle of the greatest message ever sent from heaven to earth. The announcement of a Savior, King, Christ, and Shepherd, and a motto of "Peace and good will" is made. Leaving a sentry on guard, they, with one accord, proceed by night to Bethlehem to verify this message; and there in the cave where beasts of burden were wont to repose, swaddled in the garments of infancy, surrounded by a curious crowd of Galileans come hither to pay tribute unto Caesar, they find their King, their Savior, their Christ, of whose mission their own is typical, for he is a shepherd of men. They tell abroad the tidings of the clouds, and return to their flocks.

Brother wool growers, I congratulate you that heaven's greatest message to earth, heaven's tidings of greatest joy, heaven's motto of peace and good will, came through the keepers of sheep. It signifies God's approval of your handiwork.

I love the proud bird of my country. May he perch upon America's loftiest peak and stretch his pinions from ocean to ocean. May his scream terrify the beast of the jungle and reverberate to the uttermost islands of the sea, but I propose the sheep as the meek emblem of Christendom, and the Babe of Bethlehem as the Shepherd of Antiquity, the Shepherd of the Present and the Shepherd of Eternity.

For twenty centuries he has stood at the door of the fold, with voice uplifted and arms outstretched to sheep that are out in the mountains of sin. If he comes out to where I am helpless in the desert and gathers me in his loving arms and carries me to his fold, I shall be content to join the glad refrain of peace on earth, good will toward men.

Following this paper, Governor Mount was introduced and made the following remarks:

ADDRESS BY GOVERNOR JAMES A. MOUNT.

Mr. President and Gentlemen of the Indiana Wool Growers' Association—I am glad to greet you in this meeting. Six years ago I addressed the Wool Growers' Association on the state of the wool industry and whither it was tending. I then discussed questions affecting the conditions at home and abroad, the rapid increase in South America and Australia and the conditions which confronted us here at home, which were by no means flattering to the wool growers. The point I made in the course of that address was, that the pendulum was swinging to the reverse side, and a momentum was required that would take it back to the other side. I predicted that in ten years the pendulum would be back. I said then, "the men who are going out of the wool industry under a depressed market and are sacrificing their stock, will, when the pendulum vibrates to the other extreme, be in the market as purchasers." That is true. My brothers, the great trouble with the majority of our farmers

is that they do not study the question of supply and demand. We as farmers, must study the law of supply and demand, of production and consumption. These are the basic principles upon which successful agriculture must be based. The secret of success is to buy when everybody else wants to sell. We do not use as much practical common sense as we should. It can be pointed out how the markets have varied up and down. In 1891 corn sold at 75 cents a bushel and pork at \$3 a hundred. You can readily understand what the result would be. I heard all over Indiana "I am going out of the business of raising hogs. I had better kill all the pigs on my farm." That was the time to commence raising hogs. Foreign markets were bad just at this time. It was clearly indicated that in the next year we would have an increased foreign demand. I said then I intended to prepare to sell more hogs next year than ever before in my life. I did. I did not take \$3.

I refer to this only as a warning to farmers about being governed by immediate surroundings. That is what ruins our farmers. Gentlemen, you can not make money in that way. At the present time there is no branch of farming that has a better outlook than the wool industry. Wool is going to command a good price for some time to come, but the men who have sacrificed their flocks have lost a golden opportunity. They ought to have stocked up many years ago. Now when depression in the wool market comes and the wool industry seems not to be profitable, don't wait to stock up. I said six years ago, "I am not going out of the wool-growing business. I intend to concentrate health and energy and money, and intend to make money out of the business." Do not succumb to reverses in farming.

Another thing, we must retain our present dog law. There is a report that a dog tax might be turned into a road or school tax or some other kind of a tax. That would be turning it from the purpose for which it was intended. We as wool growers must be on the lookout lest there be such legislation as will militate against our interest. We can not grow sheep in Indiana without some protection from the dogs.

There is another, and, to my mind, important thing to be spoken of, the dread scab malady that infected many of our flocks. Your President did everything in the world to obtain the passage of a law by which we could stamp out this infectious disease. Australia provided for the stamping out of the disease at the expense of the government, and did do so. Our farmers in Indiana could not get a law to give us protection or defense against this disease. I would not blame the wool growers of Indiana if they would take down the journals of the House and Senate and go over that vote and find how every man voted on that question. We have no law to compel dipping, no law to do anything in this line.

Gentlemen, we have to struggle on and discuss this question and come when the next Legislature meets to be heard on it.

There is no branch of farming more profitable than that of sheep husbandry. I have on my farm about three hundred sheep. I grow for mutton and wool. With these two objects in view I succeed in getting first-class results.

Every man will not make a success of sheep husbandry. Some will make failures. All men are not going to make a success in farming, even though the environment be good. It is the man who gives diligence to the state of his flocks, and the man who studies the condition of his herds, who will succeed.

Thanking you for the time I have taken, I will say, in conclusion, that I am deeply concerned with you in the sheep growing business, and when I go to my farm I shall go back with my energies concentrated on the question of agriculture.

Discussion followed on Governor Mount's address.

C. A. Howland: I have always believed in letting the other fellow have my sheep when they are away up on the top. I believe in buying in a low market. I have done that profitably both in buying sheep and hogs, especially if I had a breed that did not suit me. When they got high and people came and begged me for them, I always sold. Don't you know we would never have a market at all if it were not for the fools in the world? If everybody stuck to the sheep business and produced more and more every year, there would always be more than enough. It is when the fools go out of business when the wise men make money. Never sell out when you are going to lose money, but wait until you make money, and then when the thing is overdone again buy in your stock and get ready to make money again.

I hope you will recollect that point in the Governor's address. It is a good one. But to say that I will stick in the business right along, up or down, will make us all come out at the same point. The troubles that come upon the people, like the potato bug, for instance, give the wise, far-seeing man a chance to make money. If it were not for the potato bug to-day, potatoes would be so plenty you could not sell them. It is the man that gets up early and is careful, industrious, prudent, and watchful, that is going to make money out of any enterprise he goes into, and if you are not careful, industrious, prudent, and watchful, you will lose money in any enterprise you engage in.

Mr. Dungan: When we go into a business, one way to make it succeed is just to keep right along at it, and not turn to the right or the left. At the same time, it requires a great deal of nerve for a man to do that. Think what many of the sheep breeders of Indiana have passed through in the last few years! Breeders of Shorthorn cattle and beef cattle and horses have passed through the same kind of trouble. Those of us who had a large stock on hand during the period of depression found it very hard to see our neighbors who were in the dairy business or the hog business

going up, while we were going down and making nothing. After all, that may be the correct theory and principle, but there are not many people who will do it.

Member: The sheep business pays better than any other kind of business. I have been working at it for over twenty years, and there never has been a time when I didn't get four cents a pound. When the sheep business became dull, I still kept in the business. I feel now it is all on our side. I believe it is going to come out all right. The Governor had some experience with scab. So did I. I sent over to Chicago and got a package of Cooper's dip. I dipped three or four times a year. The sheep were cured with the dip. I dip once a year now. I make more money at the sheep business than at anything else.

The following subject was then introduced as a topic on the program:

Resolved, That the Indiana sheep breeders should breed first for mutton and second for wool.

The discussion was led by T. C. Phelps, of Greensboro.

This resolution, that the Indiana sheep breeder should breed first for mutton and second for wool, is practically what we are all doing now. I think we are all paying more attention to the mutton side of the sheep question than to the wool. Indiana seems to be more of a sheep breeders' State than a wool growing State. I believe we can not compete with some other places in the production of wool, but we can raise as fine mutton as is grown. We can not raise mutton without raising wool, and that wool is clear profit, as has been demonstrated a number of times by members of our Association. We have demonstrated that a pound of mutton can be produced as cheaply as a pound of beef or pork, and the manure of the sheep is superior to either. A great many people look upon flock culture as mainly a business of wool growing; in fact our Association calls itself a Wool Growers' Association, thus in its name ignoring the fact that sheep are good for some other purpose than producing wool. This is calculated, I believe, to divert attention from the sheep as a meat producer. I do not want to convey the idea that we should pay no attention to the wool. I believe we can have a good mutton sheep, and yet have a fairly good fleece of wool. I think we should be fairly careful about that when we select our flocks. We should be careful in selecting our breeding rams of whatever mutton breeds we raise, so as to secure a combination of wool and mutton, which is the preferable course for the Indiana farmer to pursue in order to gain the greater amount, or we might say, the requisite amount, of profit.

We have sheep raisers that keep flocks for several different purposes. We have the farmer that is breeding them to get early fat lambs for the butcher—and, by the way, I think the man who is pursuing that course is making money. Certainly the wool is a secondary consideration with the man who is raising early fat lambs for the butcher; he wants

the lambs that will grow large and fat in a few months. Then we have the feeders who buy large numbers of sheep at our markets and take them to the farm to consume the grain and grass, and then dispose of them at a good fat profit. He cares very little for the quality of the wool. Then we have the breeder that is breeding registered stock to sell for breeding purposes. Most of the breeders of Indiana, however, are breeding sheep for mutton, and make the fleece a secondary consideration. Most of our Merino breeders are breeding toward a better mutton type. The Delaines and Rambouillets, so popular now among the Merinos, are certainly an improvement in the direction of a good mutton sheep. You see that, after all, most of us are to-day practicing just what this resolution affirms.

DISCUSSION ON MR. PHELPS'S PAPER.

Mr. Matthews: I have been raising sheep all my life, and I have tried all kinds of sheep. I want to say that the sheep that have given me the best results are those crossed between the Merinos and some of the large sheep. They make a heavier and healthier sheep and stand rough usage better than the other kinds. I am a strong advocate of cross-bred sheep.

Mr. Endicott: The man that does not feed for a good crop of wool does not get it. I had a flock of seventy-five head of common sheep. Some of them, however, were yearlings from an Oxford buck. I raised seventy-three lambs off my seventy-five ewes. They made me a good round bunch of lambs. My common ones, being about the same kind as my neighbors', which were unfed, excelled them anywhere from three to five pounds. Some of my neighbors let their sheep run on timothy stubble, and fed them low. The better the carcass, the better the wool; the better the feed, the better the wool. I fed my sheep oats, bran, corn and clover. I want to say here that I never expect to get anything for nothing. I don't ask nature to favor me in that way. I don't want my sheep to raise me a good lamb unless I give it good food. I am satisfied that with my efforts the sheep will bring me a better profit, and raise me better lambs and ewes. Hence, feed accordingly. There are in the food elements to make wool and also to make mutton. Corn is a heat producer, while oats is a bone and muscle producer. As a wool grower clover can not be excelled by anything. Bran is a milk producer. Hence, with this feed given my sheep, I expect good carcasses, good lambs, and good wool. I consider the great thing, then, a suitable and proper amount of feed. A good body with the right food applied gives the right results.

Mr. Cowgill: I have some desire to say a few words in regard to cross-bred sheep, as, in my judgment, they are the most profitable for the common farmer. I don't mean to say that nothing should be raised

but cross-bred sheep, but for the ordinary farmer that keeps a flock of sheep upon his farm for the purpose of making a profit out of them, they are the best. I am by several years the oldest man here, and I have but little doubt that I have been longer engaged in sheep husbandry than any one here. I have been at it all my life. For the common farmer, then, for a profitable flock of sheep, my long experience has confirmed, time and time again, that a high-grade Merino ewe bred to some of the mutton breeds, will make a sheep that will yield equally as good and perhaps a little better fleece and carcass; probably not so large as a mutton sheep, but it will be large enough, a hardier lamb, and be more profitable for the common farmer. I have proved this often in my experience in sheep husbandry. All know it has been very common for the past several years, in our part of the country, for those that are breeding the mutton breeds of sheep to have great difficulty with the stomach worm. I think in all my life, since I have been breeding cross-bred sheep, twenty to thirty years, I have not lost half a dozen lambs that I believe died from the stomach worm. It is because, I think, they are a hardier sheep and not so liable to be injured by these parasites.

Question: Were other lambs injured by the same parasites?

Mr. Cowgill: I have not had much trouble with that kind of parasites in my flock, as I have had for the last twenty-five or thirty years all cross-bred sheep. My neighbors all around me are complaining.

Mr. Howland: I do not breed sheep for mutton or wool, in particular. I breed them for money. The half-bred sheep is the hardier sheep. Anything that is tender I do not want. I want some of the old-fashioned kind that have not been fed up to such a degree that they will eat too much sand and kill themselves. My old-fashioned sheep would not do that; they were not spoilt by pampering. They were not too highly fed, nor too highly bred.

J. A. Miller: The mutton breeds are a paying sheep, and a sheep that is grown largely on succulent food and must have attention. The Merino type of the cross-bred sheep will do better if left to shift for themselves or to roam over the country. The paper is good and should be discussed so that we can all understand that all men are not situated alike. I believe that those who have rolling land and have permanent pastures should have Merino sheep or Merino cross-breeds.

Mr. Thompson: The people expect less of the Merino sheep. One who has had a good mutton breed will not be content to take care of the Merino, though he could handle a good many of them in a smaller territory than the mutton. I am assured that one could make more money if he would keep half as many of the mutton breed of sheep.

Mr. Matthews: I like to make the most money with the least work.

I have a pasture adapted to sheep, high land and a permanent pasture, and some winters my sheep winter in my pasture all winter and do well. What I get from the sheep I get with little work, and get more than by keeping them in barns and giving them fine feeding.

The President next introduced Dr. A. W. Bitting, Veterinarian of the Indiana Agricultural Experiment Station, who spoke on the "Nodular Disease of Sheep."

DISCUSSION ON DR. BITTING'S PAPER.

Mr. Privett: I do not think cross-bred sheep are so liable to be affected by stomach worms as the thoroughbreds. The change from one pasture to another is good. Sheep never kill themselves eating sand; whenever sheep infected with the worm begin to eat sand, sand don't kill them. The more dirt they eat the better, if they eat the right kind of dirt. The corn field is the place to put them.

Member: What are the symptoms of the nodular disease?

Dr. Bitting: With this disease we find far more deaths among the ewes than among the wethers. They do not gain very much, and usually are found to be rather thin. We often find that an animal growing and getting fat will die with this disease; but most of them will be a little thin of flesh and the wool poor. When affected with this disease we will often find them grinding their teeth at times when it would ordinarily be unusual. They may have diarrhea or constipation. In certain cases they will have a water bag form between the jaws, or we may find a little dropsical condition under the skin. The flesh may look a little more yellowish than normal. The animal suddenly stretches out, begins to get his head back, and in about twenty-four to twenty-six hours the animal dies. There is no very definite symptom.

Mr. Phelps: This is a very interesting discussion. I had some sheep infected with this disease. I call it cholera. They died in spite of everything I could do. I began to read about the stomach parasites and concluded that was what was the matter. Since then I have lost a few. I turned my lambs into my corn field. There was rape growing in the field. And those lambs have grown and gotten fat on the rape in the corn field; they got nothing to eat but that. Something of that nature, something green, is a great help.

Mr. Thompson: Why will pure-bred sheep be more likely to be infected with this parasitical disease?

Dr. Bitting: The people who deal in pure-bred sheep lose high-bred sheep, while the fellow that does not raise pure-bred sheep is losing common kind. I do not believe there is very much in the fact that the

as the pure-bred, in fact, more so. The Merino sheep is not as subject to disease as the other breeds. The Merino is a strong, hardy sheep in resisting disease.

Professor Plumb: I have been interested in hearing the various sheep are pure-bred. The common sheep are about as badly infected parties speak of their experiences with this disease. One man examines a number of sheep and finds sand in their "craws," and blames that for having killed them. Another man says it was the stomach worm. Every man in the sheep husbandry business loses a certain percentage of his lambs, and concludes there is some reason for it. Each man comes to a conclusion as based on his own evidence. Is not that evidence seen by him in a one-sided manner? It is a fact that lambs have suffered badly from the twisted stomach worm all over the United States. The best shepherds are satisfied that that is so. I think it is one of the unfortunate things in human nature that we are so inclined to form conclusions at once from a small amount of evidence. One of the important things for our breeders to do is to familiarize themselves as much as possible with the opinions of students of the subject. There is not enough uniformity of opinion among many breeders. They don't go deep enough into the problem.

Mr. Thompson: The English flockmaster puts the lambs on clean pasture, feeds them and gives them treatment that prevents them from having the disease, and he has strong animals free from the disease. The disease is handed down through the mothers being infected and the young exposed. If they are separated while young and put on clean, dry pasture, fed, watered, and cared for carefully, they will not be infected.

Henry C. Oiler: Sheep and cattle seem to me the two main lines of live stock to be looked after now for profit. The gentlemen who made the comparison with reference to the profits of sheep and cattle got on the right subject. If a man now goes to the stock yards of Chicago, he can buy good feeding steers at five cents a pound, if they are a thousand pounds or upward. A steer of that kind will cost fifty dollars. He can go to the same yards and buy sheep for four cents a pound. The steer will require about sixty bushels of corn to feed him one hundred days, and the extreme gain will be 250 pounds. That will make him weigh 1,250 pounds. A good price for that kind of steer now would be six cents a pound. It makes that steer sell at the end of a hundred days for seventy-five dollars. He could buy for that fifty dollars about twelve good wethers, and after feeding them one hundred days on thirty bushels of corn he would be able to sell them for five cents a pound. The gain in that hundred days would be about twenty-five pounds apiece. These wethers, we will say, would weigh about one hundred pounds to start with. Each wether at the end of that time would bring \$6.25, and the twelve would bring \$75 even. From this standpoint we find that the sheep are more profitable than the cattle.

Motion made and carried that the Chair appoint a nominating committee. The following committee was then appointed: Messrs. Tomlinson, Quick and Miller.

Adjourned to Wednesday morning.

SECOND SESSION.

Second session called to order by the President, W. A. Guthrie, at 9:30 a. m., January 3, 1900.

Motion made and carried that a program committee be appointed by the Chair.

Committee on Program: Professor Plumb, Mr. Privett and Mr. Thornburg.

Mr. Harshbarger: The subject of parasites in our sheep was not fully discussed yesterday. I would like to give the results of my experience and observation. I have handled sheep all my lifetime with the exception of one or two years. When a boy I had to feed and care for a flock of sheep. I believe every farmer and every renter ought to keep some sheep. Two years ago my son and I decided that one of our pastures was getting too brushy. We had rented it out for fifteen years to a man who had pastured nothing but horses and cattle on it. We wanted to clean it up, so turned a flock of sheep in there. There was a pond in the pasture, and along in August, September and October we lost a good many of the lambs. There had been no sheep pastured on that land for fifteen years, and we were a little puzzled to know what to do. We took them home and put them in an orchard lot and began to give dry feed and pump water for them, and gave them plenty of salt. We lost two or three more and then sold the lot out. Last year we changed our flock from one pasture to another. They had pond water and well water to drink, but they began to die again. Then we put them into a clover field, and we only lost one after that, but they did not improve as they should. We got some medicine for them at Crawfordsville that we were satisfied with. We do not know what the medicine is made of, but it is very satisfactory. It is put up in buckets and can be had for \$3 a bucket. My experience with sheep is this, that when they are kept on very short pasture all summer they are not troubled with worms. I am satisfied a rank growth of grass is not the best thing for sheep. Those who keep their sheep on short pastures have better flocks of sheep than I had when I kept them where there was a rank growth. Their sheep were all fatter and better than mine in the fall, although mine were in better condition in the spring when they were turned out to pasture.

I think every one who is fond of sheep should raise them. If a man

is hoggish enough to like a hog better than a sheep he should raise hogs. but if he is fond of sheep and will raise them he will be sure to make a success of it.

Mr. T. E. Bowles was then introduced, and he presented an address on

RESULTS WITH A FLOCK OF FORTY EWES.

T. E. BOWLES, OF NOBLESVILLE.

In our institute work, which we have been at for twelve years. I often hear the remark made, "A poor man can not do the things you tell about here." The farmers say they can not follow our advice because they have not the money. I am going to demonstrate that a man can get into the sheep business with a little money, provided he has a little credit.

In 1895 I dropped out of the sheep business on account of the depressed condition of the market. I had just put up new buildings and was short of money, but I went to the bank and borrowed one hundred dollars for sixty days. I came down here to this city and bought forty sheep at the stockyards. In sixty days I took twenty-two sheep back and got a little over one hundred dollars for them. I then had eighteen left. Then I bought ten more at one place, ten at another, and fourteen at still another. I took them home and sorted them out and sold sixteen of the wethers. Then I took two of the bucks that I knew were pure Shropshires and sold them for ten dollars apiece. At the end of about seventy days I had a flock of forty ewes that I had made without a dollar invested, except my time and labor. From that flock we raised forty-seven lambs and sold the entire lot. They were not as good as I liked, for they only weighed eighty pounds apiece, but we sold the lot for \$140. The fleeces were not very good, but we clipped enough to sell for \$52.40. This paid for the keeping of the ewes. They paid for themselves in other ways as well. I had a piece of land that was an eyesore on the farm, a piece of land covered with wild sweet potato vines. I was told when I bought that land that I never could get rid of these vines. I wanted to sell the land, but the purchasers all objected to those vines. That year I put the flock of sheep on that land. They cleared off these vines and improved the looks of the land. It was worth the keeping of these sheep one year to get that piece of land cleared and the eyesore removed from the farm. No other animals could produce such a result as this.

Talking about results, I was in a neighboring county sixty miles from home, and the farmer with whom I was stopping said, "I took your advice at the institute and bought one hundred ewes, and I am sorry for it now, for they are eating up everything on the place." I said, "Of course, they are fond of green things, and I wonder they haven't

eaten you before this time." I tried to convince him that it would pay him to keep them, but he would not, and offered me the entire flock for \$517. I did not take him up then, but hurried home and wrote him a letter asking if he would still take that price for them. He wrote back that he would, and on the 27th of March those sheep became my property. I rented a pasture of twenty-seven acres for \$30. We raised one hundred and thirty-six lambs from those one hundred ewes. That year I sold \$731 worth from that flock by the first of September. I told a banker in my town what I had accomplished on that investment of a little over \$500. He said that was better than banking, gas stock, or anything of that kind.

I never came in contact with dogs while I had this flock of sheep. A return of \$731 on an investment of \$517 in honest, square, legitimate business is a transaction which I challenge any hog, horse, or cattle man in the State to duplicate. Another thing, I can handle these sheep myself, but I don't want to scuffle with a hog nor a Shorthorn steer nor a Percheron horse. A man can go into the sheep business who has a credit of four dollars. A man can get a loan on a flock of forty ewes on any bank or from any farmer who has money; they will be considered ample security.

DISCUSSION ON LOWLES' PAPER.

Mr. Harshbarger: I endorse every word Mr. Bowles has said. In 1844 I bought fifty acres of land. That place was considered the filthiest farm there was in the whole country. It had on it jimson, ironweed, thistles, alders, and almost every weed you could mention. The ironweed would grow eight to nine feet high. You couldn't see a cow a few feet from you. I said I was going to clean it up. It was a terribly dirty piece of ground. I went to work, turned my sheep on it, and told my neighbors to bring their sheep, and they did; there were three hundred sheep on it during May and June. It was a sight to see how they cleaned that field of weeds. Some of the lambs began to die. The reason of this was there was an old shed under which was dust and filth. They got the lung fever from that dust. That was the reason they died. A neighbor said I had killed my sheep with ironweeds. The reason was that I had succeeded killing those ironweeds and he had not. Now in the course of a few years I had that pasture cleaned out. Now it is a pretty pasture without brush or weeds on it. If you want to clean up a pasture that is the way to do it. The sheep won't eat the jimson, but they will, after the pods begin to burst open, lick all the seeds out of the jimson pod. If you are bothered with the lettuce trouble, they will eat that out, though I don't think they will touch the sweet clover. You will have to mow that down just before it blooms. The lettuce will, if mown down, simply grow up in larger stalks than ever. The lettuce stalk sometimes makes a great stool three feet across.

Member: When I was bothered with white-cap clover, I would turn the sheep on it when it was about three inches high and let them root it out. When the clover comes out in bloom it is too late then to turn the sheep on it.

Prof. C. S. Plumb, of Purdue University, was then introduced, and made the following address on

THE IMPORTANCE OF PURITY IN BREEDING.

PROF. C. S. PLUMB, OF LAFAYETTE.

In 1897 I spent some time in Europe. The sole purpose I had in going over there was to visit the stock farms. I was impressed, I think, more with the uniformity of quality in character and type than with anything else. Now Great Britain has become famous all over the world from the fact that the British people have adhered to certain classes of live stock, and have not continually changed about and worked at something different all the time. The Shropshire breed of sheep is in England the most common one. It is more widely distributed than any other. There are localities there where people have found out to their own satisfaction that certain breeds will grow and develop better than others. In Wales you will find the Welsh class, in the Highlands of Scotland the black-faced Highland sheep. I climbed about in one of the highlands of Scotland; there I found the black-faced Highland sheep; in the Cheviot hills, lower down in the Highland country, the Cheviot sheep took up their abiding place. When one goes down into the center of England he finds the Cotswold; in Shropshire, another class; in Suffolk, the Suffolk breed. When the farmer attempts cross-breeding, he understands very well what he is attempting. If you would go into an American audience of stock men, the average man there could not tell you what he would get from certain crosses. In Britain the ordinary English and Scottish shepherd will tell you just what the butcher's stuff is before you. They have studied the subject and know what they can and what they can not do. There is very little crossing done for breeding stock, except by a few men of great ability. We find that the standard for the purity of breeding there is far superior to our own. The average character of their flocks is a higher standard than our own. There is a very large amount of careless breeding done in our own country. The average farmer does not want to pay over ten dollars for a sire. The farmer should know when he has an animal of merit. That means he should be able to take up a sheep, go over it, and be able to tell whether the sheep is a first-class specimen or not. Yet you know the sheep is one of the most decep-

tive of animals to act as a judge on. There are plenty of farmers who buy because they are pleased with what they see. We ought to have in our fairs, as we are having in some of our best agricultural schools to-day, a means of giving a little schooling in the judging of a type. It is important, first, for a farmer to know how to pick out a good thing immediately; to understand the character of the fleece; what kind of wool is on the different parts of the body; the different kinds for the different breeds; and the value of the different classes. He ought to know something of these things. They have a good deal to do with the character of the flock. He should not be afraid to use the knife, and constantly study to build up the character of his flock. How many men do you suppose there are in this country who go into their flocks and cut out and dispose of to the butcher the inferior males and females, and so set a standard that will lead up higher and higher?

I once made a visit to one of the best breeders of pigs in this country. In talking with him I asked him if he ever sold inferior individuals to the butcher. He said he never did, that he sold those for a low price to breeders. Now no animals should go out from his stock excepting those that come up to a certain standard. One of the greatest weaknesses with Americans is that they do not adhere to a fixed type.

Some men handle sheep for a while and then dispose of them and take up pigs because sheep are too low in price, and then they go back to the sheep business when the pig market becomes dull. They fluctuate from one thing to another. The man who will take up one breed and develop that, who will stick to his line, learn all he can about the work he has taken up, will come out in the end in advance. There is one principle I have always talked to my students, and that is, I don't care very much what class of live stock a man will handle, if he has the quality of stick-to-it-iveness, he can make a success. There is everything in going at a thing in a determined way with a fixed principle.

The more the breeds are mixed up in Indiana, the greater the variety of pure breeds in this State, the greater the amount of crossing we have in Indiana, the more it will weaken the State as a State to which people from without can turn for high-class breeding stock. If the State had nothing but pure-bred Shropshires in it, the rest of America would turn to us, and it would be a great center for Shropshires. In many individual localities in England you will find only one breed. The people have found a thing that suits their conditions, and have stuck to it. What is the result? Russia, Germany, the United States, all go to England for stock. The more they split up, the more they introduce other elements, the less patronage they will have, the less amount of money will be dropped into their counties. The more our people can concentrate themselves on certain fixed principles, the better we will be off, the more trade will be directed this way.

I am not preaching in favor of everybody raising thoroughbred sheep.

We should have two classes of sheep, one that will supply the breeders, and another class that will furnish material for the butcher. The man who furnishes material for the butcher ought to know what he will get when he attempts certain crosses. He ought to know the demands of the Chicago, Indianapolis and Louisville markets, and make his crosses so he can produce mutton or wool that will supply them. We don't, as a people, look high enough or breed high enough. Our standard is low. We should get more breeders at work on a higher plane.

DISCUSSION.

A Member: I like that talk; it meets my views exactly. Suppose I send a superior pure-bred sheep out to one place. A neighbor comes along, and asks, "Where did you get that sheep?" When he is told he wants one like it. Another man sends me a letter for one as good. People in that neighborhood want sheep like it. Soon business is directed my way. I do not need to advertise.

Mr. Privett: England has in different places one breed of sheep, and all in one locality handle the same breed. I believe in that; I advocated that fifteen or sixteen years ago. If in every county the farmers would breed certain flocks, soon those counties would become centers, and other States would send there to buy by the carload.

Mr. Plumb: Last week I was in eastern New York at Cooperstown, which is a center for breeding Cheviot sheep. I spoke of the reputation that that vicinity had secured in America as a producer of Cheviot sheep. I made an appeal to the Cheviot Association not to give up the fine reputation they had already established in that region. It is worth a good deal of money for them to be known as leaders, and they should hold to that breed. In fact, Indiana to-day is beginning to press them hard for prestige in the character of the flocks.

Mr. Cowgill: The remarks of my friend here this morning induce me to believe that the few words I said yesterday about the cross-breeds need some explanation. Now, I don't believe it is the best for anything to be crossed first with one kind of sheep and then another, say with the Shropshires one year and some other the next, and keep perpetually crossing the sheep. What I meant and do mean by a cross-bred sheep, and what I have found to be the most profitable sheep for me, is the high-grade American Merino ewe bred to some of the mutton breeds. I don't care about their being pure-bred, but I want them from one-half to three-fourths at least. The American Merino sheep is a large bodied, fine wool sheep. If you want to breed for lambs to sell when they are but a few months old, it does not make much difference what kind of sires you breed to of the mutton type. I am inclined to believe from my own experience with the Southdowns, while their carcass will not be quite so

large. the lambs are generally hardier, mature earlier, and are ready for the market when they are eight or nine months old. I believe I prefer them to any of the other "Downs." I have a little flock that I raise lambs from for breeding purposes especially. Frequently, I go over to Ohio or up into Michigan and get some man I have confidence in to select a flock of ewes for me. I tell him what kind I want and have him select them to breed from. By doing that you can keep a type of sheep that are not pure-bred, and they will be as uniform a flock as pure-bred sheep.

Now that is what I mean when I say a cross-bred sheep is more profitable for most of the farmers than the pure-bred sheep. There are very few persons here this morning that have not at some time or other been acquainted with some man who has bought pure-bred sheep, who in a little time would let them run down, and he would say there is no profit in the business. It is right for some to keep pure-bred sheep enough to stock the farmers. The average farmer is not able to take care of that kind of sheep; they are not profitable to him. You may go to my flock of sheep (some two or three hundred, and not so many as I have been in the habit of keeping), and you will see, I think, as uniform a flock as you will find anywhere. My lambs weigh from eighty to ninety pounds at eight or nine months old, are all hardy and saleable, and I have made a good deal of money from the little investment I have made in sheep. My long experience has taught me that they are the most profitable stock that a man can keep.

Mr. Phelps: Professor Plumb gave us some very good advice. We are all guilty of selling sheep that are not good for breeding. The buyers are as much to blame as we are. When I send sheep to a man that depends on me I would not send him one I would not use in my own flock. But we have some that ought to be sold to the butcher. A man comes to us and wants to buy sheep and he sees with his own eyes and knows he is buying sheep we would not be willing to breed ourselves.

Professor Plumb: Suppose a person knows nothing of breeds and crosses, and he was, like Robinson Crusoe, stranded on an island, and he happened to fall upon a flock of pure-bred sheep, now do you think that that man would, from the fact that he had gotten hold of pure-bred sheep, find weaknesses there that would not be had if they were cross-breeds. The black-faced Highland sheep, that are as pure-bred as any in the world, are the toughest in the world. They will withstand the greatest severity of the Scottish hills. You find the sheep here biting and nipping away at the heather, they scramble around in the Highlands like goats, and yet they are as pure-bred as any class that is known. Now I grant that the Merino is one of the hardiest types of sheep there is in America, but do you think a cross-bred Merino is stronger in constitution than the pure-bred?

Member: A pure-bred flock of Merinos are as hardy as any class of sheep. In the cross-bred sheep it is the Merino blood that makes the flock prosperous and profitable to keep.

Mr. Miller: I endorse what Mr. Plumb has said, but I am surprised that Mr. Plumb did not consider our own country. The history of sheep in this country shows that they have been raised to an excellent standard. In all countries they have their specialties and follow their lines. The climate has something to do with the business. In traveling through Mexico I saw flocks of sheep that you would not want. They are vagabond-looking sheep. Yet the Texas man will go and buy those ewes, then go East and buy the Merino rams and breed with them. They get a fine class of lambs.

The climate here is different from that of England, and we could not go to England for stock.

A sheep is the most ignorant of all the animals on the farm. They have the least judgment of any on the farm. I have been in the business for twenty-five years. I have been raising sheep, pigs, mules and horses. The mule is the smartest. Pigs are more reasonable to handle than sheep. The sheep will go to the trough, after it once learns the way, if it has to run over a dog.

A motion was then made and carried that the Program Committee be allowed to hold over to a later date, and in conference with the Secretary and President make the program.

Mr. Plumb: I think it is a desirable thing for the Association to meet away from Indianapolis and get about among the people. I am going to make a proposition to the Association. Next May I propose to have at Purdue a sheep-shearing festival; I think it will be delightful for you to take part in this work. We have a sheep-shearing machine which we will get out; we will have a program and make it a fine thing. I want to make it an official invitation for you to make us a visit at that time and come prepared for a regular old revival meeting.

Motion unanimously carried to accept Professor Plumb's invitation to the Association.

Moved and seconded that it be left to the officers and the Program Committee to set the time of meeting.

An amendment to the foregoing motion moved and seconded to the effect that the Executive Committee have power to call a meeting at some other point in the State if they saw fit.

Mr. Phelps: Any other place than Indianapolis, it seems to me, would be a failure. This place is the most centrally located, and has the best railroad facilities. I am fearful any other place would be a failure.

Mr. Plumb: There is not a single industrial meeting that meets at Indianapolis that is a success. How many of you here have taken an active part in this meeting? In Lagrange County the halls would be crowded at a meeting of this Association. They would do more work there in two days than you will do here in ten years. We had just such meetings of the Dairy Association at Indianapolis as we are having here. Since we left Indianapolis we have had hundreds attending our meetings. One of the best authorities said to me: "I have attended meetings in Wisconsin and Vermont; yours has a better attendance and more enthusiasm." Do you know why? Because we have gone out to the people. Here there are too many issues, too many attractions to divert attention. While it is a good thing for some people who have means, it does not suit the masses. This Association has got to meet the people if it is to be a success. What is the reason we can not get out a good strong report of our own to be distributed among the wool growers? Why can not we have a good strong organization, instead of such a one as we now have? This is not an appeal, but simply, can't we do something to put new life into our veins? I tell you there is a chance to do some business, but you can't do very much of it in this sized room.

A motion was made and carried that the time and place of meeting be left to the officers and the Program Committee.

The Committee on Nominations submitted the following names as officers for the ensuing year:

For President, W. A. Guthrie.

For Vice-President, Sld Conger.

For Secretary, Prof. C. S. Plumb.

For Treasurer, T. C. Phelps.

Motion made and carried that the report of the committee be accepted.

Moved and seconded that Professor Plumb cast one vote for the entire Association for the President.

Mr. Plumb casts the vote of the Association for W. A. Guthrie.

President Guthrie: I thank you for this honor; it is one of pleasure as well as of profit. I feel we are a very small organization compared with what we should be. We have a good field; I am not satisfied with the work done this year. If you will give me your united efforts we can have a meeting next year that will pay any of us to be present.

The Secretary, Mr. Robe, casts the vote for the rest of the officers herebefore named.

Motion carried that a vote of thanks be given the old veterans, the Secretary and Treasurer.

Adjournment.

TWENTY-EIGHTH ANNUAL CONVENTION

OF THE

Indiana Shorthorn Breeders' Association.

SUMMARY OF PROCEEDINGS.

The twenty-eighth annual convention of the Indiana State Shorthorn Breeders' Association was called to order by President E. S. Folsom, at the State House, Indianapolis, Indiana, Wednesday, January 3. Forty-two members responded to the roll-call. This was a very gratifying response to the untiring efforts of the officers during the past year to rebuild the Association to its old-time numbers and enthusiasm. It might be well to mention in this connection, at the outset, that before the close of the meeting eighty-two breeders had paid their fees and had become members. After the minutes of the last annual meeting and reports of officers, which showed the Association in splendid financial condition, the President's address was heard. It covered very thoroughly the entire field of progress and possibilities for this famous breed. It dealt with not a few unique ideas for the advancement of the interest in the breed and was highly pleasing to all members present.

The President's address was referred to a committee consisting of Messrs. Quick, Robbins and Smith. This committee took up in detail three subjects for consideration from the address, namely, first, the advisability of making an Indiana breeders' sale at some central point; second, the advantages of holding a calf show, open only to Indiana breeders and members of this Association, at the next State Fair; and third, the advisability of supporting a department in some agricultural paper.

The committee on the President's address recommended a free discussion of these matters in the meeting, and their final reference to the Executive Committee with the sense of the Association. First taken up was the matter of a breeders' sale. After a most enthusiastic discussion, the Association voted unanimously to hold a breeders' sale of prime, well finished animals, in the pink of condition. This sale is not to be con-

sidered in any sense a combination sale or one of surplus stock. It is open only to Indiana breeders, who must be members of this Association. The number that each breeder may place in the sale is limited to three, not more than one of which number may be a bull. Three prizes are to be offered, one for the animal selling for the highest price, another to the breeder selling the two highest priced animals, and another to the breeder selling the three highest priced animals. The entire matter of management, arrangements for and conduct of the sale is left in the hands of the Executive Committee, in whom is also vested the prerogative of rejecting any and all animals not in sale condition. The sale will occur about the first of June, for which a date will soon be claimed, probably the 6th.

The next question receiving the attention of the meeting was that of a calf show. It was decided that for the purpose of giving small breeders and others not classed as professional breeders an opportunity of exhibiting their stock, prizes should be offered for calves of both sexes, under one year of age, to be shown at the Indiana State Fair in 1900. At least five prizes for each sex will be offered, aggregating a sum of about \$500. No animal shall be allowed to compete for these prizes that is one of a herd that competes for herd prizes offered at the Indiana State Fair; no breeder not a member of this Association will be allowed to compete for a prize, and each competing animal must be calved the property of and owned by the exhibitor. It is deemed that this gathering together of 50 to 100 young Shorthorns will be a grand object lesson to awaken the farmer to a realizing sense that his scrubs are not good enough for him. The encouragement to the young breeder will be very great and he will be inspired to renewed efforts.

The matter of a department in an agricultural paper was referred, after considerable discussion, to the Executive Committee, with power to act.

No better or more interesting program was ever given to a Shorthorn audience than that of this convention. Not a party to the program was absent but Mr. Judy, who was ill. The paper on "The Public Sale and Its Place in the Business of Breeding Shorthorns," by Mrs. Virginia C. Meredith, created a lengthy discussion, and a vote of thanks was voted Mrs. Meredith for her able effort. She said the breeder's methods must now become business methods, such as the merchant observes. He seeks to meet a demand which he himself creates by advertising the merits of his ware. This advertising may be through the rural press or be brought about by means of good pasture and rich feed. The public sale of Shorthorns may be considered in three phases: First, its effect or influence of promoting the interest of the breed; second, the obligations of the seller; third, the obligations of others in the same business. The sale conserves the best interests of the breed by disseminating animals, thus establishing herds in many places in the hands of most enterprising

farmers. Public exhibition also assists in this matter of recruiting the breeders' ranks from among the farmers. At a public sale the attendance is made up largely of those who at least are sympathetic and those who are more than half persuaded. There is opportunity for personal contact, discussion of points and pedigrees, together with the possibilities of the breed. It is different from the discussions at the show ring, where competition is keen and criticism is often acrimonious. Mrs. Meredith dwelt at length on the obligations of breeders to each other and to Shorthorn interests at a public sale. The seller is under obligation to make known in a plain and unmistakable way the breeding, and, as well, the defects of any animal. His animals should be in good condition, creditable to the breed. Anything less than meeting fully these two requirements is not calculated to forward the popularity of the Shorthorn.

The visitors at a sale are under obligation to show a good will towards his brother breeder making the sale, and to assist him in every manner possible. She said, "There is, among those who have the intelligence and taste to engage in breeding Shorthorns, a keen appreciation of what is due to one who meets the expense attending a public sale. It is, therefore, rare to find one so lost to the dictates of common courtesy as to intrude the claims of his own stock in competition with the sale animals."

Then followed number three, "Experiments in Shorthorn Breeding," by A. Smith, Deacon, Indiana, in which some valuable points were brought out as to cross and line breeding, advertising, etc. He called attention to the methods of Amos Cruickshank, particularly, and the fact that his fine animals were made by crossing many families. He earnestly recommended that no more be put on paper for advertising purposes than may be found on the farm of the breeder, and urged that we make our word as good as gold.

Mortimer Levering, Lafayette, favored the Association with a well written paper, showing conclusively that "superior breeding insures superior merit in feeding." He substantiated his position with many conclusive facts and figures. We regret that we have not the paper at hand, that we might draw upon it more largely.

Doubtless the feast of the whole program was "A Visit to the Shorthorn Herds of Great Britain," by Prof. C. S. Plumb, Purdue University. It was with intense interest that every member present followed him through the old stamping grounds of Bates, Booth and the Collings, and listened to his graphic description of the old-time places of activity, now fallen into disuse. Not less interesting, however, was his very careful description of the herds of the Queen, Duke of Westminster, which he visited and photographed, and also the Royal and other shows which were attended.

Last, but not the least, on the program was "The Shorthorn—the General-Purpose Breed," by W. S. Robbins. Attention was called to the

fact that the dual value, perhaps, did not exist in greater evidence in any other breed than our favorite. Drawing upon statistics, he exhibited the wonderful shortage in cattle, not only in the United States, but the world, in comparison with a few years ago. That no longer could the calf be knocked in the head by the dairyman at birth, but that he must hold a herd of dairy cows which will produce calves sufficiently meritorious for feeding purposes to be raised and turned over to the general farmer for feeding. He gave a splendid description of what a general purpose cow should be and what she should be capable of doing.

A lively discussion followed, and steps were taken, after remarks by Professor Plumb, towards securing for the State Agricultural Institution a number of Shorthorn cows for tests. It seems that no reliable and at least sufficiently adequate investigations have been made by the Experiment Stations to show the comparative value of the Shorthorn cow with those usually employed in the dairy.

The money for the calf prizes, mentioned early in this report, was left to the Executive Committee to raise by contribution. They concluded to commence the matter before the adjournment of this meeting, but unfortunately, it was postponed until half the membership had withdrawn. The effort resulted as follows:

President E. S. Folsom, Indianapolis.....	\$20 00
Indiana Farmer, Indianapolis.....	25 00
The Farmers' Guide, Huntington.....	20 00
J. G. Robbins & Sons, Horace.....	20 00
S. R. Quick & Son, Brooklyn.....	20 00
Miller & Sons, Carlos City.....	20 00
Douglas & Sons, Sulphur Hill.....	20 00
I. J. Hammond, Greencastle.....	20 00
Christian & Sons, Indianapolis.....	10 00
E. E. Sours, Warren.....	10 00
George Kirk, Linwood.....	10 00
Heagy & Sons, Columbus.....	5 00
J. F. Huckelberry, Horace.....	5 00
Cotton & Son, Manilla.....	5 00
Dr. Eastman, Indianapolis.....	5 00
Kenzle & Thom, Noblesville.....	5 00
B. H. Phillips, Arlington.....	5 00
A. B. Stanton, Indianapolis.....	5 00
Miles Madden, Kingman.....	5 00
J. W. Harper, LaFountain.....	5 00
A. Smith, Deacon.....	5 00
W. A. Macy, Lewisville.....	5 00
Joshua Strange, Arcana.....	5 00
Total made up.....	\$255 00

This amount was made up from the limited number present in about fifteen minutes. The matter of completing the fund and arranging for the show was left with the Executive Committee of the Association. It desires to increase the prize fund to \$500, and it is possible that it will be distributed into two classes other than that made by sex—those under six months old and calves over that age. It has also been suggested that a first, second and third prize be offered for a calf herd of five head. No more interesting sight can be imagined nor a better object lesson be placed before the farmers attending the Indiana State Fair next fall, than 100 head of beautiful red, white and roan bovine babies.

The election of officers resulted in the unanimous selection of those of last year, namely: E. S. Folsom, President, Indianapolis; I. J. Hammond, Greencastle, Vice-President; Walter J. Quick, Brooklyn, Secretary, and A. E. Leavit, Vernon, Treasurer.

PROCEEDINGS IN DETAIL.

FIRST SESSION.

The Indiana State Association of Shorthorn Breeders met in Room 29, State Capitol Building, January 3, 1900, at 9:30 a. m., and was called to order by President E. S. Folsom, of Indianapolis.

On roll call eighty-two members were present. The Secretary and Treasurer presented their reports, which were referred to a special committee to report at a later session, after which followed the President's address to the Association.

PRESIDENT FOLSOM'S ADDRESS.

Gentlemen of the Indiana State Shorthorn Breeders' Association:

It is not my purpose to detain you with a long address on the science of breeding, feeding and kindred topics with which you are familiar, nor recount the events of the past year that have gone into Shorthorn history. I will briefly state what seems to me, if put into execution, will not only advance our individual interests as breeders, but will popularize to a great extent this already popular breed of cattle. The long depressed condition of our agricultural industries has taken new life, and among these none promise more remunerative returns than does that of breeding high-class, pedigreed cattle for grading up and bringing to such early maturity the cattle on the farm as to enable the farmer to breed and feed cattle for the markets in competition with the western range.

The production of beef of the highest quality at the least cost is an industry in which every citizen of the State is interested. While we are not directly beef producers, we are, in a measure, responsible to the consumer for the quality of the beef he consumes, and to the feeder for a remunerative market for the feed products of the farm. To meet these demands and advance our material interests as breeders of this matchless breed of cattle, as well as acquire and maintain that high standard of excellence reached by the noted breeders of the past is in part, the work for this Association.

We have no war to wage on kindred associations or on other improved breeds of cattle. There are places for all. Each has a place to fill, and as water finds its level, each in time will find its place and fill it.

Ours is an association of breeders of Shorthorn cattle, organized, as specifically set forth in the preamble to the constitution, "to promote a more perfect understanding among breeders and farmers at large in the State of Indiana, and to encourage further improvement and preservation in its purity, this matchless breed of cattle." That breeders should be in closer touch, that the farmer should have a better understanding of the real value of the Shorthorn on the farm, as an adjunct to successful and profitable farming; that improvement of the Shorthorn should be further encouraged, and its purity preserved, are propositions on which, doubtless, we can all agree. How best accomplish these objects are the questions for us to consider. I am of the opinion we have too long neglected the farmer. He should be better informed of the value of the Shorthorn as a dual-purpose animal, and the unprofitable market he makes for himself in feeding his grain and bye-product of the farm to inferior, low-grade cattle.

I know of no more practical way to reach the farmer and give him a knowledge of this breed of cattle and its real value to him on a farm than through the columns of a general agricultural paper. As a rule, the farmer limits his reading of farm papers to a single paper on general agriculture, and gives very little attention to the cattle branch of his industry. The farmer who is a persistent reader of a good live-stock paper does not long breed scrubs. It would, therefore, seem advisable that steps be taken by this Association to secure and maintain in some agricultural paper of general circulation in Indiana and adjacent States, a department in the interest of the Shorthorn. Such paper should receive the loyal support of the breeders of the State by a liberal use of its advertising columns, and the editorial columns of such department should not be forgotten by the many able writers to be found among the breeders and admirers of this breed of cattle.

One of the numbers on our program is the "Public Sale." This topic will doubtless be ably discussed by the writer to whom the topic has been assigned. I desire especially to outline a public sale, which, for want of a better name, we will call a breeder's sale. Such a sale should be made

at some central point, accessible to all the breeders in the State, and on neutral ground, that each contributor to such a sale may stand on an equal footing. The management of such a sale should be in the hands of a competent committee. There should be a limit to the number of animals that a breeder may contribute, and above and below which he should not be permitted to go. A majority of all animals contributed should be females. One or more prizes may be offered and paid to the breeder or breeders whose contributions make the highest average. To pay these prizes, a small per cent. of the gross receipts of the sale may be set aside and charged to the expense of the sale. A contributor to such a sale can afford to offer none but meritorious animals, in the pink of sale condition; as the rank of the breeder and the character of his herd will be determined by the character of his offering. I am of the opinion that a sale on the lines suggested will tend to elevate the public sale standard, bring to public notice breeders who, through modesty or want of opportunity, have not let their breeding operations be known, and create such friendly strife for rank in the sale as to make it the banner sale in the State for the year 1900 of any and all breeds of cattle. It has been frequently charged, and doubtless with some show of reason, that the live stock exhibits at our State Fairs have, to a large extent, fallen into the hands of professional exhibitors. While this may not be strictly true of all live stock exhibits, it is practically true in the beef-cattle departments. I am of the opinion that such encouragement should be given to breeders, not professional exhibitors, whereby the best specimens of their own breeding may be brought forward and allowed to compete for show-yard honors. I would, therefore, suggest, as an experiment, that the first exhibit be limited to one class—that of animals under one year of age. In this class the expense attending preparation and exhibition will be but nominal. This would open the door to every breeder in the State. No breeder, not a member of this Association, should be allowed to compete for a prize, and each competing animal should be bred and owned by the exhibitor. Five prizes may be offered for both males and females, as follows: \$40, \$30, \$20, \$15 and \$10, respectively. This makes a total of \$230 in prizes. No animal should be allowed to compete for these prizes that is one of a herd that competes for class and herd prizes offered by the State Board of Agriculture. Entries in this special class would not be barred from competing for the class and sweepstake prizes offered by the State Board, and if winners there, would also be winners of the prizes offered by the National Association, which will be equal to those offered by the State Board. A large part of the prize money would, doubtless, have to be raised by voluntary contributions of Shorthorn breeders and Shorthorn admirers. This can be done by making the proper effort. Is there a Shorthorn breeder in the State, who, in contributing to such a fund, will not be richly rewarded in seeing forty or fifty of the best Shorthorn calves in the State lined up for the judge's work? What an object lesson

to awaken the farmer to a realizing sense that his scrubs at home, after all, are not good enough for him. What encouragement to the breeder with a small herd to return to his home with \$50 or \$75 in prize money, and the honor of having the best Shorthorn calf in the State. Doubtless every winner of the ten prizes would again in time be heard from in the show yard, not with single animals, but with entire herds.

If we expect to maintain first place for the Shorthorn we must not forget that our cattle have worthy competitors, championed by men that are alive to the situation. If we lose our place it will not be from the fact that we have not the best breed of cattle, but for want of keeping in touch with the spirit of the times in pushing our favorites into public favor. I therefore most earnestly request that if you are of the opinion that the suggestions made are practical, that you carefully consider them, and devise ways and means to put them into execution.

DISCUSSION.

Mr. Quick: For one, I am very highly pleased with our President's address. It indicates a revived interest and thoughtful consideration of the subject of Shorthorn breeding and those points necessary to advance it toward the millennium, I would venture to say, of Shorthorn breeding; I believe at least to the highest point of Shorthorn breeding in the State of Indiana. What we need is something new along the lines advanced. We hear it from Hereford breeders of the United States, and the world, in fact, that we are actually seeing the shadow. We have heard excellent suggestions in the President's address, as I take it; some things that will give us a new interest; the public sale suggested, and other things; and I would, therefore, move that we appoint a committee on the President's address, such committee to consist of three, and to take up the suggestions made and report on them at a later session.

The motion was seconded by Mr. Hammond, and unanimously adopted.

The President: I will appoint on the committee Mr. Walter J. Quick, W. S. Robbins and Artemas Smith.

Mr. Leavitt: I wish that some of our members who have been attending recent sales would give us their ideas on the probable success of such a sale as you have suggested.

President: That may come up after the next paper. Perhaps these points will be raised in the paper.

A paper by Mrs. Virginia C. Meredith was read:

THE PUBLIC SALE AND ITS PLACE IN THE BUSINESS OF BREEDING SHORTHORNS.

The place of public sales in the business of breeding Shorthorn cattle is an important one; indeed, it is not without an important bearing upon the profession of breeding Shorthorns. Assuming that one has fairly well mastered the profession, has truly learned and faithfully obeyed the laws which control the preservation and perpetuity of type, and possibly may have gone farther and deeper into the profession, learning the laws that enable one to modify and improve type, yet the fact remains that after the Shorthorn is created and matured its owner is confronted with the problem of how to realize the money value that is and ought to be the conclusion of the whole matter; that is and ought to be the summing up of the results of knowledge and care. The breeder's methods must now become the business methods which the merchant observes in selling his wares; he seeks to meet a demand; and he must himself create the demand by advertising the merits of his wares; his experience will be very like that of the merchant—he will find other sellers in the field, other sellers trying to convince the owner of good pasture and rich feed that the Hereford, the Polled Angus, the Red Polled, or some other breed, perhaps of the dairy type, is the most profitable purchase that can be made. The public sale of Shorthorns may be considered in three phases: First, its effect or influence in promoting the interests of the breed; second, the obligations of the seller; third, the obligations of those engaged in the same business. First, then, in regard to promoting the interests of the breed, in a preliminary way, it may be said that there are two considerations which give to the Shorthorn its premier position among pure breeds of cattle. First, is the fact that it is especially adapted to the arable farms of a fertile country, because it will profitably use rich pasture and expensive grain; second, with the Shorthorn, as in no other breed does aptitude follow sex—the cow for good milk and plenty of it, the steer for the best beef and at the earliest age. No other breed of cattle can in the same degree claim these useful characteristics. The best interests of the Shorthorn are promoted by getting them established in many places and in the hands of the most enterprising farmers. To do this requires their public exhibition. The agricultural fair has always been a most satisfactory place to advance the interests of pure-bred cattle, but scarcely second to it is the public sale. The ranks of Shorthorn breeders are recruited from farmers and not from converts or proselytes from the ranks of the breeders of other cattle. At a public sale the attendance is made up largely of those who at least are sympathetic; is made up possibly of those who are more than half persuaded. In the hours preceding a sale there is time for personal talk, time for discussion

of points, pedigree and performance such as is hardly possible elsewhere. Breeders of experience are generous in giving information, suggestions and illustrations to one who seeks them, and many a wavering opinion may be changed into a strong conviction by the straightforward statement of experience. The gossip and traditions of the breed are not without value, and are only passed on by personal conversation at such times. The history of Shorthorn in early Britain, the environment that indicated their creation and improvement, the aims and the courage of the early breeders, all have a special fascination when heard from the lips of one who has mastered the literature of the subject. And it is on a sale day that these themes have free course. At the show ring, when competition is keen, criticism is often acrimonious, and the beginner or seeker after knowledge is not helped as he ought to be helped.

There is, too, a great lack of correct knowledge among breeders themselves in regard to the true type of Shorthorn, and the private and personal discussions at a sale help to solidify correct judgment. Very great advances are, however, being made by having the judging at fairs done by competent men who indicate clearly the breed type. It may be said, in passing, that Shorthorn breeders have not always remembered their obligations to the breed, but have sometimes sacrificed breed type to beef type.

A very great advantage derived from the frank and informal talk on the occasion of a public sale is that the extravagant claims made for rival breeds may be met and answered. It is well known that some of the claims made for some of the pure breeds are without a sane foundation, and yet they go unrefuted in public print, because no one wishes to play an ungracious part even for the sacred cause of truth.

On the second point, something might well be said in regard to the obligations to Shorthorn interests which should be observed by one who makes a public sale. Because it is recognized that purity of breed is an important factor in the value of the animal, the seller is under obligations to make known in a plain and unmistakable way the pedigrees of the animals offered; and more, he should present the animals in good condition, creditable to the breed. Anything less than meeting fully these two requirements is not calculated to forward the popularity of the Shorthorn. The seller should present his cattle well trained to lead and stand; good behavior is as commendable in cattle as in children and older folks. And one who invites the public to bid on his cattle is bound to treat his bidders fairly by giving all reasonable information.

On the third point, only those who have made public sales are qualified to speak understandingly. In an experience at Oakland Farm, covering a period of more than forty years, it has been demonstrated again and again that the good will and help of those engaged in the Shorthorn business has been of inestimable value. There is, among those who have the intelligence and the taste to engage in breeding Shorthorns, a keen

appreciation of what is due to one who meets the expense attending a public sale, and it is, therefore, rare to find one so lost to the dictates of common courtesy as to intrude the claims of his own stock in competition with the sale stock. And it is in this connection that one finds the greatest factor in the business of Shorthorn breeding; that is, the acquaintances made, probably no other factor is so important in contributing to success. Not even the customers who buy and continue to come again and again to make purchases are as helpful as the acquaintances who can and do say generous and appreciative things on sale day.

DISCUSSION.

Mr. Thompson: I have had several years' experience in public sales, and my experience is like that of a great many others. Sometimes I felt well over my sales and sometimes I did not. I believe Mrs. Meredith states the question quite fairly. I have been to several of her sales, and she is telling her own experience, and I think it is very well done, better than I could do it myself.

Mr. Endicott: I have had no experience in conducting sales, only as being a purchaser at a sale; had my initial experience this fall over at Mr. Shaffer's in Ohio. I appreciate very nicely the spirit that Mrs. Meredith indicates by her paper; that is, getting the cattle in good shape and treating your customers nicely. I had no idea when I attended Peter Shaffer's sale of dropping more than \$300 or \$400, but before I got away I dropped more than that \$700. Yes, I got over \$700 worth of Mr. Shaffer's stock. I am confident that the reason of his success and the fact that his sales are well attended has been because he has treated every one of his customers nicely; and he certainly had a beautiful sale.

Mr. Quick: I would like to call attention to one point in Mrs. Meredith's address, and that is right at the last part of it, where she calls attention to the good that others can do the party that is making the sale. Our firm has had seven public sales. There is a certain party that I do not think ever missed but one of those sales, and I do not believe he ever attended a sale that he did not make several customers. He hardly ever comes to this Association; I don't know why, but he is always busy talking to somebody and punching some one and keeping up interest in the sale. I believe she has struck a very vital point there, and I believe it is our duty to assist all we can. Whether we want to buy or not, to give encouragement and enlightenment and to solidify the ideas of those who have been in the business a longer or shorter time than we have and give them the history of the breed and the course of events as they are going along. As Mr. Endicott has said, he was doubtless influenced somewhat at this sale by others who were present. We want others not only to buy but also to learn. He learns more than he knows, and consequently he

buys more. We see an animal catalogued and want to learn more of it. We are satisfied, but we want to see the cattle. Perhaps we do not purchase that particular one, but we see something else there that is better bred. I really think this is one of the finest papers along this line I have ever heard. Ideas are taken up there that we have not thought of particularly before. There is a feeling advanced there that we ought to have. Each should help the other in this public-sale business. We should turn out, and while the maker of the sale is not always successful, I believe they do good where the members of this Association thus sell and encourage the people to buy the best sort of cattle.

Mr. Harper: There is an old saying that "Poor things take a great deal of selling and good things sell themselves." I think it is too often the case that our breeders get the little end of the horn. They get the stock that takes a great deal of selling, and, so far as I am concerned, I would rather pick out my own than go to a public sale and take what is there. Too often breeders have to pay for what they get in that way.

Mr. Collins: I would like to ask one question: What did Mrs. Meredith mean when she said that many sacrificed breed type to beef type?

Mr. Smith: May I speak on this question? The early Shorthorns were more of a milking cattle, as I take the paper in that respect, than they are of late, but excessive feed has, to a certain extent, done away with that type. In that respect it is sacrificed to the beef interests.

Mr. Robbins: I speak myself for Mrs. Meredith's paper, although I am like the last gentleman, I did not know what she meant by sacrificing breed type to beef type, because I regard beef type as one of the most essential points. If she had said Shorthorn character I would have understood it. Rather than discuss the question further I would like to have some enlightenment on that part of the paper myself.

Mr. Quick: I think Mrs. Meredith's sentence before that explains, to some extent at least: "There is too great lack of correct knowledge among breeders themselves in regard to the true type of Shorthorn, and the private and personal discussions at a sale help solidify correct judgment. Very great advances are, however, being made by having the judging at fairs done by competent men who indicate clearly the breed type. It may be said, in passing, that Shorthorn breeders have not always remembered their obligations to the breed, but have sometimes sacrificed breed type to beef type." I simply think that Mrs. Meredith means this: That sometimes a very bad animal that is fat, by an incompetent judge is given first prize, when a better animal is not given the prize because he is not given the show of flesh. I can not think of anything else from her sentence here.

Mr. Leavitt: There is one thing in Mrs. Meredith's address that struck me quite forcibly. It is a matter I have often thought about, and that is where she referred to Shorthorn conversation. I think we sometimes lose sight of the subject. For myself, being a young breeder and not being away often at sales, I find Shorthorn conversation very profitable. I think it is very profitable to get away and converse with some older men in the business, get their experience, get their opinion of certain show-yard victories, and the remarks that they make to you about their success in Shorthorn breeding. There are a great many interesting points brought out. For the sake of furthering our interests, it seems to me, if we could have headquarters in some of the city hotels it would be quite an advantage for us. Now there are a great many of those present who came last evening. If we could have spent the evening together it would have been of great interest to us. I think that the maintenance of interest in the breed is something that is profitable to us all.

Mr. Collins: Mr. Chairman, may I talk on this question? This paper of Mrs. Meredith's suggests to me this: That the true Shorthorn type is not the beef animal. It is not the dairy animal. It is both. And when under the present pressure for beef stock the breeder wants to sell something which suits the person who wants beef stock. She is checking breeders against shifting everything toward beef type instead of breed type. The breed type would combine both, but beef type would ruin the Shorthorn stock which combines both.

Mr. Douglass: I would like to ask if in Shorthorn cattle beef type is not breed type, and should the breed type be more toward the dairy than the beef type?

Mr. Endicott: Mr. President, I do not understand Mrs. Meredith's proposition; there is noticeable a discussion of the beef type. She is talking with reference to the public sale. Now, then, is preparing cattle for a public sale to be carried to the extent of confining to that which will destroy their prolificness as producers? There is such a thing as feeding a heifer to a point so that she can not produce. Holding a public sale is holding a sale of stock that will produce. Do not destroy prolificness by reason of overfat.

Mr. Strange: I would like to offer this opinion. If in all pure-bred animals there is not rather a specific breed type existing in them?

Mr. Douglass: I would like to ask if she is not referring to condition and not to type. The condition of the animal is brought forward and not the type.

Mr. Thomas: She uses the word "type" in both cases. She is using the word "type" and not referring to condition. I do not believe she

meant to change the type of the animal. The condition that the animal is in can be changed, it is quite true, but the type is there whether the flesh is three or four inches deep or one inch. You can not change the type.

Mr. Macy: I think, truly, that feeding can bring out the type very much like an artist with his pencil can bring out the design. I think that is Mrs. Meredith's idea. I have watched the growth of that Oakland Farm through Mrs. Meredith's management, and also knew it when General Meredith, the father, was in charge. Their idea in conducting the farm is to keep up the type of Shorthorn cattle. As our Secretary has said, I think there is a lack of Shorthorn men holding together and pushing the interests of the Shorthorn breed to its extreme. If you have read very much, you have noticed that the Hereford men have advertised, and even used our stock paper, *The Indiana Farmer*, and have hung together, and have pushed themselves well to the front. I do not think we need to be alarmed at the paper, because she meant to strike vital points that some of us are needing. When we go to a sale we should maintain the interest of that sale. I have been to sales when there were breeders that actually talked against the sale. At Oakland Farm, I have seen Mrs. Meredith lead out an animal that was not in condition to sell, but was really a fine-bred animal. All she intends is to bring that out. Sometimes we criticise a little too sharply.

Mr. Robbins: Mrs. Meredith is not here to take her own part in this matter, and we ought to go a little slow. Perhaps I am wrong in this particular sentence. It seems to raise quite a squabble. I think there is a breed character in Shorthorns which we all desire. It has no connection whatever with the breed type. I am inclined to think what Mrs. Meredith was urging us to not lose sight of was that character changes but breed never does. The character is not the same as it was twenty-five or thirty years ago, but the breed of the cattle is the same as when I first knew them, at least.

The President: Any further discussion on this paper? The subject is not exhausted yet. I am of the opinion that the public sale is a benefit in this particular. It has a tendency to fix the value of the Shorthorn, or to indicate the value of the Shorthorn to those who are not posted in its true value. The farmer goes to the breeder to purchase an animal. He thinks the price is too high. He makes a comparison, in part, with what he gets for his own stock. He thinks that the breeder is asking him an abnormal price. Perhaps he visits a second breeder and finds the same conditions obtain. When he attends a public sale and finds that the value is fixed there he finds the true value. One animal may bring \$100, another may bring \$800, with individuality equal. This causes him to think and to study why the one animal brought \$100 and the other \$800. There the public sale is an educator to him.

Mr. Strange: With your leave I would like to say something about some sales I have attended in Indiana and Kentucky. I believe the public sale of Shorthorn cattle is made for the purpose of distributing the breed over the country for the benefit of farmers and Shorthorn interests. It should not be as some sales which I have attended. These sales where the cattle should have gone to the butcher instead of the public. In that way the Shorthorn interests are injured. As Shorthorn breeders we should not permit it. I believe that when we make a sale to benefit the breeder it should not be the object of the breeder to prune his own herd, but it should go anywhere in the country as good representatives of the breed. Now, I think some sales have been advertised for the purpose of maintaining the interest of Shorthorn cattle; perhaps that has been the object, while other breeders have sought to prune their herds. Now, as Mrs. Meredith indicates in her paper, as to the types and character of the breed, that is a thing in breeding that we should keep in view all the time in our herds. In pruning our herds, if it is something that we do not want or think that we have no use for, let us not offer at public sale what ought to go to the butcher. At our public sales we can benefit the public and Shorthorn interests in general, unless there is a disbursement of animals which would not sell on their merits. We can not get the character of our Shorthorns too high. The special characteristic of the animal which the butcher will select has not the special formation of the animal for the breeder. Many sales have been of benefit to the general public.

Paper by Artemas Smith.

EXPERIMENTS IN SHORTHORN BREEDING.

ARTEMAS SMITH.

The subject assigned me, "Experiments in Shorthorn Breeding," seems indefinite, as the whole of the business is experimental. Experiments are something new, something with which we are unfamiliar, hence, experiments in breeding Shorthorns may be something out of the usual course pursued by breeders of Shorthorns, or it may be the course usually followed by breeders; but either way will be an experiment to the beginner. In the usual course, I will say, buy good stock; study the business; get the benefit of those who have succeeded, and never forget that the first requisite is a good feeder, a developer. Our mutual friend, the lamented Mr. Thomas Wilhoit's watchword was, "Feed all they will eat." After our herd is started, perhaps the most important experiment for us, the one upon which depends our success, more than any other, is the buying of

a new bull for the herd. As the bull is more than half the herd, we wish to emphasize our need of caution, and I will say, if any breeder present will tell me of an infallible rule and guide to success, I will call him my benefactor and he will have earned my lasting gratitude, for, upon this, the mating of our females with a suitable male, depends everything. This is the science of breeding and either leads to success or to failure. There are many experiments of which we might write. As has been said, the whole life of the breeder is one of experiment, more or less successful, but as we can not treat of all in one short paper, we call your attention to what is known as out-crosses. Mr. Amos Cruickshank, of Scotland, pursued a course of out-crosses and attained great success. Not all of the out-crosses resulted so favorably; as, for instance, the Alloy cross, which is an extreme case. We do not advocate line breeding, nor incestuous breeding. We believe in out-crosses within the limits of the breed.

Wishing to preserve the blood as near pure as possible, therefore we do not approve of the Polled-Durham cross, although it is said by some Shorthorn breeders to be the same blood. If this were always true we should not urge our objection so strong, but knowing of instances where the Polled cattle have been evolved from the native muley cow and a Shorthorn bull, we warn beginners to look well to pedigree. We are not prejudiced against the Polled-Durham; we accord him an open field, and we say, bon voyage to the gentlemen who are engaged in his breeding, believing that there is room for all; but we do not like his climbing to favor on the reputation of the Shorthorn. We are aware that there are polled Shorthorns, but few; we do not remember of more than two polled bulls being imported, but our Polled-Durham breeders claim the double standard for many herds, hence, what is the origin of all these herds? We will not presume to answer this question, but fear that the desire for hornless heads will result more disastrously than the celebrated Alloy cross; and the damage to Shorthorns, resulting from that cross, can not be estimated in dollars and cents. We also wish to say a word on the experiment of advertising. The object sought is to put us in communication with those who need our goods and who have the means to pay for what they want. We like to visit stock farms where the copy of the advertisement has been written with regard for truth and modesty. Sometimes breeders in their anxiety to attract visitors, put more on paper than is found on the farm, but the breeder who breeds Shorthorns as a life-time pursuit, who is enthusiastic in his devotion to his business, for the sake of the business, will be found reliable and his word is as good as gold. A judicious use of printer's ink will pay as good a per cent. on the investment as his other experiments. In conclusion, cling to Shorthorns; be slow to adopt innovations; guard against them, and when we discontinue breeding, may it be said that we left a goodly heritage to those who come after us.

DISCUSSION.

Mr. Harper: My impression was that this Association was in the interest of Shorthorns and Shorthorn breeders. Sometimes we slip away from the real subject in the discussion of Herefords, Polled-Durhams, etc. I think we need not look after those fellows at all. They are perfectly willing to look after and take care of themselves. We should advertise and discuss our own breed.

Mr. Quick: I admire exceedingly those articles of Professor Shaw, than whom there is no better student of animals in the United States. He says elevate the Shorthorns as high as they should go, and as high as anyone could. He does not do it directly, but by his definition of the dual-purpose animal, he means one that is all right for beef as well as for milk. We want a dual-purpose animal that will feed in the pen and milk well when it comes to the pail.

Mr. Miller: I do not know that I am prepared to say anything of any benefit, but I am well satisfied with my occupation in breeding Shorthorn cattle. It has been a great favor to me and I am well satisfied with that business and have had good success. I would rather hear from some one else from whom I could learn something.

Adjourned, to meet at 1:30 p. m.

SECOND SESSION.

Meeting called to order at 2 p. m. by President Folsom.

Paper:

DOES SUPERIOR BREEDING INSURE SUPERIOR MERIT IN
FEEDING?

MORTIMER LEVERING, LAFAYETTE.

Every well-informed breeder of cattle will agree that a well-bred animal is a more profitable one to feed than a poor or indifferently bred one.

How far superior breeding is essential to the better qualities of an animal as a feeder is a question that admits of a wide field of argument among the farmers of to-day. Men are ever debating in their minds the question whether it will pay better to raise stock and feed their grain to it,

or to take the grain to market and sell it. To solve this is often a serious problem to them. Even the light gained from experience and observation does not clearly prove a solution. Too often cattle are fed at a great loss, and it is a fact that a majority of the cattle fed consume in feed far more than their marketable value. There is probably no greater loss sustained by our stock feeders than that incident to the feeding of average "stockers." Buyers go into the market and buy the meanest and poorest young cattle offered because they believe that there is more room for flesh on them.

To insure a profitable return a buyer should go into the market and buy the best animals that he finds there. For example, a seller has two calves of about the same age, say ten months; one calf is fat and sleek and the skin on him is soft, pliable and velvety to the touch; he will weigh 900 pounds. The price asked for him is five cents per pound, the highest market price, bringing his value to \$45. The other calf weighs but 350 pounds, and he asks the ordinary market price of two cents per pound, and that brings him to \$7. For example we have taken the two extremes, the best and the poorest calves commonly seen. A farmer in starting out to buy should look at the live stock reports in his daily paper. In calves he will see, prime, 4 to 5 cents; common, 2 to 3.75 cents per pound. Let a farmer buy one of each kind and make an experiment. They are to be fed side by side from the same trough and hay rack. He will find if there is any difference in the amount of feed consumed, the lighter one, owing to his bony construction, his lithe nervous, active temperament, will eat faster and eat more than his docile, phlegmatic, fatter companion. The value of the food eaten by them will be \$25 for each animal; adding this to the original cost we have \$70 for the better one and \$32 for the poorer one. He will ship them to market at the end of the year, and the market will afford him the following result, estimating the ages at twenty-four months each: The first one will weigh 1,650 pounds and commands the highest market price, 8.25, which makes him bring \$152.62; the other steer will weigh 750 pounds and brings the lowest price quoted, 3 cents, which will bring for him \$22.50. In the first case the feeder has made a profit of \$82.62, and on the second he has lost \$9.50. Recently a steer sold in Canada for the block at 11 cents per pound; he weighed 2,010 pounds, thus bringing his owner \$221.10. These cases cited are not at all improbable or unusual, but are to be seen daily in hundreds of cases in our leading stock yards. Such feeding of indifferent common mongrel-bred live stock, whether it be of cattle or of sheep or of hogs, is the principal cause of the failure of so many farmers. Very often men mortgage their farms to secure cattle to feed, and then buy the greatest number they can for the money, number and cheapness standing with them rather than quality and breeding. If the careless buyers, and they are in large majority, hear of a few young cattle that are for sale at a certain price for the lot, and the price is very low per head, they often buy by the price per head, without even

looking at them. It often happens that steers are sold as yearlings when among the bunch several are more than two years old, but they are "runts" small for their age, and no matter how much they may be fed they will not make any perceptible gain in flesh.

The papers everywhere during the past three weeks are heralding with great head lines, "High prices paid for fat cattle." Market reached \$8.50 per hundred for two steers, and \$8.25 for a car load of steers. The papers by this announcement published only one-third of the facts, to which the reader is entitled and which should be published in the same item as a matter of education for the breeder and feeder. A better and more correct report of the sale would have been to print: The best bred car load of steers brought to the Chicago market since 1882, brought the highest price paid for cattle since that year. These cattle were practically pure bred Aberdeen Angus cattle, and not alone that they were pure bred, but were out of very superior bred cows of the most noted strains of blood and sired by the famous Aberdeen Angus bull that was champion at the Omaha Exposition last year and sold for one thousand dollars. Here we see the results of superior breeding. Three things are evident: The cattle were as well bred as possible, they fed and fattened in the best possible form and they brought the highest possible price. We will suppose that the breeder of these cattle paid \$1,000 for the bull to use on his fine cows and he only had him sire these twelve steers; even that would have paid him handsomely. Only see what these cattle sold for: They averaged 1,550 pounds and sold at 8.25, or \$127.87 per head, or \$1,534.44 for the thirteen head that were sold. On the other hand, if he had used a common mongrel bull, these steers would have averaged 1,100 pounds and the price quoted the same day the others were sold for such steers, called in the market fair to medium steers, 4 cents per pound. They would have brought \$44 each, or \$572 for thirteen, the same number.

From this lesson we must learn that it is not profitable to breed grade animals either for the herd or for the stock yards, and the more nearly we approach the highest standard of excellence in breeding and individuality the more profit we can make in the business of feeding. It is a lamentable fact that the average cattle fed by our farmers to-day are, in stock parlance, "eating off their heads." It is the fact that a majority of cattle will not sell for one-half of the value of the feed they consume. If you estimate what it costs to feed a steer of the poorer bred kind, you will find it to be about this first year \$16, second year \$25, third year \$25; total \$66. Such steers will average 1,300 pounds and sell at about 3½ or 4 cents per pound or \$45.50, or \$52. But a high-grade steer should weigh 1,600 pounds at two years old and sell at a higher market price from 5 to 6 cents per pound, or \$80 to \$96.

It will be said that the average farmer can not afford to raise pure-bred cattle. This is true of the individual, but a dozen or more could club together and purchase a good bred bull and keep him in the neighborhood

for the use of the club. In a few years a township might become prosperous in the high prices obtained for their cattle. It should be made a violation of law for any man to keep a bull for breeding purposes that was not inspected and approved by a properly commissioned officer. In Germany it is unlawful for a man to use a stallion on his own farm or give the service to others unless he is inspected and approved by the government and branded with the royal arms. Such a law for our cattle would make prosperous a large class of men who are bankrupting themselves by pouring into the ravenous maw of mean, unprofitable cattle, the rich products of their toll.

When men are buying cattle or keeping cattle of their own raising to feed they should know if the animal is free from tuberculosis or latent consumption. Some doctors tell us that one person in every seven of the human family dies from that disease, and we are led to believe that the same or greater proportion of cattle are affected with it. When a calf or older bovine has this disease well developed they will remain poor all their days. No matter how much food is given them it is not assimilated and does not go into the tissue and make fat. Good bred and well fattened cattle rarely have this trouble, and here again is an advantage in elevating the blood lines of our herds. The nearer that stock approaches the perfect animal in breeding according to pure-bred standards of excellence the greater satisfaction will be found in feeding it for market and relatively more profit will be derived in its sale.

DISCUSSION.

Mr. Robert Mitchell: There are no beef cattle better than the Shorthorns. Mr. Levering's paper speaks of the Polled-Angus. As you know, I was born and reared in Scotland, the home of the Polled-Angus. The people there pay almost as much rent for their land as you do for your land in fee simple, and they raise these cattle to help them pay the enormous rents. I have had many opportunities to give expression to my opinion of what is the best breed of cattle for the average farmer, and I always say the Shorthorn cattle are the best. They have stood the test of time as well as any cattle that have ever been raised in this country. The younger you can market your animals the more profit you will have; but you must get the very best breeds to get the best results. Get the breed that matures early. I always advocate this. I am glad to see so many Shorthorn breeders at this meeting. We should not allow our meetings to go down, but should strive to keep up the interest in them. If we do not meet and talk up our own interests no one else will do it for us. I think one thing we make a mistake in, and that is in having several of these meetings going on at the same time. I think these meetings ought to be held the week of the State Board, beginning in February.

Let the State Board hold their meeting at the close of that week. Let all of the industrial meetings come together. If the premium list is not right you will be there to look after your interests. Then you can divide the week, having one meeting one day, another the next, and so on. None of the meetings need consume more than one day. In this way those who attend can stay for all the meetings if they wish. I breed fine cattle, hogs and sheep, and I want to attend the meetings representing each of these industries, but in the present manner of holding the meetings, can not do it with any degree of success. Next year our Legislature will be in session and there will be a committee appointed for memorializing that Legislature to amend the present sanitary law. The legislative body can not afford to disregard the wishes of so large a body as meets here annually.

Mr. Thomas: One point in the paper has particularly interested me. That was the point he made that the difference in the price of the two lots of steers would pay the price of a good sire. Almost any farmer can see from this that he can not afford to have a poor bull, when the difference in price in twelve head of cattle would pay the price for an improved sire.

Mr. Strange: There are some points in this paper that need to be talked about. For instance, a lecture was given at Purdue last fall by Kingan's purchaser of cattle, in which a remark was made by him to the effect that the highest priced cattle on the market and the ones he paid the best price for were the crosses between Shorthorns, Herefords and Polled-Angus. The purchaser of beef cattle for the Kingan Packing Company of this city made that statement in a lecture to the farmers of the State. I asked him if there had ever come before him a carload of pure-bred cattle of any of these breeds, and he said, "No." I asked him, then, how he knew these crosses were the best beef cattle. His statement was that the crosses of the Shorthorns and the Polled-Angus made the best beef animals. I asked him how he could raise an animal of higher standard, when he took the superior animal that had all the superior qualities and crossed it upon an animal that had inferior qualities. The result proved that he did not know as much about it as some of the farmers he was trying to instruct. I was not willing to let that statement go unchallenged before the farmers of the State, and did not let it go.

President Folsom: It seems to me that one point has been overlooked. The question is whether a farmer to grade up his cattle, would be justified in buying a highly bred animal in preference to a plain one. A registered Shorthorn may be a highly bred animal or it may be a plain-bred one. Would there be any difference between the produce of a highly bred animal and the plainer bred one?

Mr. Mitchell: I was once called in to pass upon the merits of a highly bred animal, and he was the ugliest animal I ever saw. But I certainly think the superior bred animal will take precedence of anything else. The animal that is highly bred is more likely to transmit his own good points to his offspring. The merit must be in the animal and in the breeding combined.

A VISIT TO THE SHORTHORN HERDS OF GREAT BRITAIN.

PROF. C. S. PLUMB, LAFAYETTE.

As some of you know, two years ago I had the pleasure of making a trip across the water, and seeing something of the flocks and herds of the Old Country. I am sorry that I can not cover the field of Shorthorn herds as fully as I know some of you would like to have me. My object in going over was not entirely to visit Shorthorn herds. You who know what my work at the University is know that it is quite essential that I should have a knowledge of the various breeds. My trip was, therefore, for the purpose of visiting the breeding farms of Great Britain. While I visited a great many farms and was in the country most of the time I spent there, I only took a part of the time in looking over Shorthorn herds.

I went over on a live stock boat, so as to see how cattle were handled at sea. I landed at Liverpool, went from there to Chester, and then drove out into the country to visit the estates of the Duke of Westminster, whose death we have recently heard of. The estate is a magnificent one of 25,000 acres. The Duke was one of the richest men in Great Britain. There was on the estates a Shorthorn herd, and also a few Highland steers. On that estate I was given my first view of the good dairy Shorthorn. I saw a sight there that could not be duplicated in this country. The milking Shorthorn of Great Britain is an animal of much the size of some of the old-fashioned Shorthorns, not carrying the amount of flesh that the Shorthorn of the beefier type does, but with a very magnificent development of the udder and milk veins. There were about sixty Shorthorns in that herd. They have a Cheshire cheese factory on the estate, and the milk of these cows was used in the manufacture of that cheese. These cattle were pure-bred, entirely so, but they did not keep the animals registered, and so the herd as a herd might be viewed from a different standpoint from some of the other herds I saw. I think it would please any of you to see the fine showing these cattle made, with their fine, large udders, and all the fine qualities of what you would call the best general purpose cow.

I went from the Duke of Westminster's estate up to Manchester, where the Royal Society show was in progress. I took a great deal of interest in the Shorthorn exhibit there. In the English shows they have a very excellent arrangement that we might use to advantage here. It has been used in the horse shows in this country to some extent. All the animals entered were properly classified and each animal had a number given it, then the name of the sire and the dam, the name of the breeder of the animal, and a few facts were put together in book form and passed around at a small sum of money. A man going to the show could take his book in his hand and go anywhere about the show, and by finding the number of the animal could find all the facts about it. Then, after each show was over, there was posted in a conspicuous place near the show ring a list of the prize winners. The next day after each show there was distributed a printed statement showing the winnings of the day before. The show lasted a week. I think their management of the shows far superior to anything we have in this country. I went in there a complete stranger. The Secretary handed me a volume that was made up entirely of entries for that show. I took it and went about and found out everything I wanted to by simply looking at the animals and learning their numbers, and then referring to the book.

There were two classes of animals there on exhibition. There was a general purpose cow, which really meant the milking Shorthorn; just such cattle as the Duke of Westminster had on his place. There was a fine show that had been gathered from England, Scotland and Ireland of these large, heavy milking cows, a large majority of which were Shorthorns, most of them reds. Then in the other class there were the pure-bred Shorthorns, making up such a show as you will find in this country. I was impressed with the idea that we could meet them, so far as the show ring went, on their own footing. The first prize bull was not nearly so good a bull as Gay Monarch. I thought as I looked over the animals that if they represented the pick of the herds of Great Britain that our Shorthorns were certainly, in a show sense, the equal of those in the Royal Society show; in fact, if some of our cattle had been there they would have been winners.

Perhaps the thing that interested me most was a visit over into the old Shorthorn country, where the Shorthorns originated. I took a train and went into the Darlington district, the heart of the Shorthorn country. One thing that surprised me was the slight impression the Shorthorn breeders there had left on the people there at home. The history of Thomas Bates and the Booths and the Collings is known a great deal better in the average agricultural college in America to-day than it is known right there at their old homes. We first found out where the old homes were, and then went to look for a livery stable, but none of them knew where the Booths or the Collings had a farm. Finally a veterinary surgeon told us of a farmer who lived in Cleavysby who could tell us.

about the people we inquired for. We walked down through Darlington and crossed the River Tees, over a beautiful stone bridge, then tramped for a couple of miles over a typical English road to a little borough called Cresby. There we found a man whose father years before had bred Shorthorns. This man had gone out of the business. He told us where Thomas Bates's place was, but his directions were not clear, and told us there was a butcher in Cresby who would tell us more about it. We went to the butcher and got what information we could, but that was not very satisfactory. However, we found out where Kirk Levington was, and got a cart and drove to Thomas Bates's old home. We found the churchyard where he was buried, and had an opportunity to look through the old Bates home. The old house is like a telescope. They started in with the small end, built a small stone building, then another larger and then another, until they had a long stone house. They had the customary stone barns and sheds there, such as we find all over Great Britain. They were damp and disagreeable, I thought. They have stone floors and it seemed to me it would take an ordinary American summer to warm one of them up. They do not have the same sanitary conditions that we have. The stables and yard at the old Bates home were empty, except for a pile of brush in the middle of the yard and an old sweep mill that Thomas Bates had used. The place was then in the hands of a tenant, who leased it from one of the Bates heirs. I was told that his lease would soon expire and that the place would be sold.

We were given the privilege of going through the house, but there was nothing there to indicate that Thomas Bates had ever lived there. The next day we decided to continue our travels, and to look up the old home of the Collings. The little place called Kirk Levington, which is little more than a postoffice, lies southeast of Darlington. The old homes of the Collings lie north of Darlington. We went to Ketting Hall and Barmpton, which were the homes of the two Collings. These were the men that bred the famous white heifer that traveled, also the great red steer. Ketting Hall is a large brick house on top of a hill, with a magnificent surrounding of fields planted with grain, but there are no buildings or barns around there. All the barns that Charles Collings raised stock in have disappeared. The farm has been in the hands of tenants for many years. The present tenant has been on the place twenty years. All we could see was just the place where Charles Colling had lived.

We next went on to Barmpton, the home of Robert Collings. We found there the most interesting of the old farm dwellings which we saw while in York. It was a magnificent aggregation of barns and house. They were nearly all connected with stone walls. The sheds had not been disturbed for centuries, but there was not a Shorthorn there. We visited the house, but there was nothing left there that reminded one of him. This was a beautiful rolling country, with plenty of water,

plenty of sweet grass, and all the conditions such that one might look for a fine development of live stock, but there were no Shorthorns there.

Next we went to Oran, where Col. W. C. Booth lived. If you ever have an opportunity to be entertained by W. C. Booth, I assure you it will be done right royally. The first thing you are asked when you go to a home over there is, "What will you take?" You must go to the dining-room and they will bring in a pitcher of ale, unless you prefer Scotch whisky, some cheese and bread and cake. When you go to a place the first thing you must do is to eat and drink, and then you are ready to go and see the live stock. Mr. Booth first took us into his house and gave us the customary refreshments. The only animal he showed us there, although he had more, was a red Shorthorn bull, not such a one as I expected to find there. He weighed something in the neighborhood of 1,600 pounds. He was about four years old, and one of the Studleys, an animal that a man who was a discriminating breeder would not want to say much about one way or another. This was disappointing, and yet Mr. Booth's place was a very valuable one to go to. He had magnificent paintings that had been made in the old days of Shorthorn glory. There were fine paintings of Necklace and Bracelet made by one of the famous painters of England. The walls of the house were fairly lined with these pictures.

We next went to Willoughby, the home of young John Booth. John is a grandson of old Thomas Booth. Here is where some of the famous Booth Shorthorn history has been made, but there was not a Shorthorn on that place. There were fine courtyards and stables there, box stalls all around the courtyards, and all the arrangements such as would satisfy the most exacting stockman, but there was nothing but cobwebs in front of the entrances.

Next we went to Walloughby. This was the only place in the district where we visited where we found Shorthorns being bred on a modern basis. Richard Booth has a fine farm there. Old Mr. Rottery, who was Cruickshank's stockman, is now stockman for Richard Booth. He brought out a fine Studley bull for our inspection. Then he showed us about twenty cows. They were thin in flesh, and did not show the body that you would naturally look for in an English herd. In the stable we saw a number of cows and the things that impressed me most were that they were mostly reds and whites, and were mostly rather thin in flesh, so thin that they showed their ribs. The next thing that impressed me was the breadth of loin and back and the great depth of the animals in the flank. I thought that with the sire they had there and with the enthusiasm that Richard Booth showed, and with the desire of perpetuating the name of Booth in the Shorthorn world, that there was a chance that some day the herd at Walloughby would be heard from. We have herds in America to-day that are far finer than the herd at Walloughby, but that herd was interesting because it was the only one we saw that belonged to the

families of any of the old breeders. Richard Booth also had fine paintings of the famous Shorthorns of history. All of the Booths had fine collections of silver cups and other silverware that had been won by the old family, such a collection, I suppose, as can not be seen anywhere else in the world.

I finally brought up at the Shaw farm on the Queen's estate. There one can see a royal show of Shorthorns. There may be better herds of Shorthorns in England, and I think if one went out into Scotland he might find finer herds there. At Windsor they have a line of stone sheds, not fancy ones, simple one-story sheds, with a stone-paved yard. In those yards they had a collection of Shorthorn bulls that any man might feel proud to possess. Christmas Gift, one of the famous ones, was there. They show that the Queen's herd will be heard from in future as well as it has been in the past. The manager of the Queen's establishment had been gayed some because it was said the only prizes the Queen's herd could win in the show ring was with animals that had been bought from other herds. A lot of the animals they had when I was there were of their own breeding, and I think a good many prizes are being won by them lately. One thing I learned there, and that was that the judges never hesitated to turn down the Queen's stock any more than they did any one's else.

I saw two herds of Shorthorns besides these. I saw a herd of milking Shorthorns being driven to pasture. There were two types there, the distinctive beef animal and the milking Shorthorns. One cow was called Rosemary, a most remarkable cow. She was just simply a mountain of meat, flesh thick, and fairly smooth. She had been a repeated prize winner, and in spite of all these things she had dropped a calf every year. She was as fine an example of fine breeding power coupled with great flesh as you could possibly look for.

They had one bunch of beef Shorthorns that were isolated that looked very attractive. One thing that struck my attention was the large number of roans I saw there.

As you go through England you will find a large number of milking Shorthorns. Out in the meadows and fields near the large towns where the milkmen have pastures you will find plenty of milking Shorthorns, and they are nearly all roans.

I was greatly interested in one thing I saw, and that was some of the herds of wild cattle. I visited the greatest herd in Great Britain, at Chillingham, and saw there a very remarkable thing, four generations of breeding a Booth white bull on two wild Chillingham heifers. The progeny that was closest related to the wild stock had something of the characteristics of the wild stock, but when it got down to three or four generations you could not tell them from the purest of Shorthorn breeding. They were going to register in the Shorthorn Herd Book of Great Britain after the fourth generation some of these animals as pure-bred Shorthorns. That is allowable in the English herd book.

I visited numerous other places, but made no special trip to inspect any other Shorthorn herd. I saw here and there a Shorthorn, but no other noted herds. The next trip I make over there I shall make a special trip up into Scotland and get about with William Duthie, William Marr, and some of the others. I made the personal acquaintance of William Marr, Jr., and was with him at two shows. In speaking of cattle I asked him if he had any on exhibition at the show where we were then. He said that he never showed, but simply bred for other people to show. There was at that show the renowned animal Sign of Riches, which he bred, and which was afterwards sold in South America for an enormous sum. Mr. Marr also bred Gay Monarch. What a fine standard that man had! He bred for other people to show, but did not show himself. A great many people in that country are breeding such poor stock that they dare not show them, but Mr. Marr did not refrain from showing for that reason.

REPORTS OF COMMITTEES.

The Committee on President's Address made a report, which was accepted.

Mr. Quick: The part we wish to discuss first is the matter of a public sale mentioned in the President's address.

Mr. Endicott: I think the success of the public sales by the Hereford men ought to make the Shorthorn people move up. Why can not we make such an effort as they have made?

Mr. Hammond: In view of the fact that the National Shorthorn Breeders' Association is talking of holding such a sale, I think it somewhat out of place for this Association to attempt it this year. I would recommend that the breeders take an interest in the National Association sale instead of instituting one here this year.

Mr. Thomas: A great many breeders in the State of Indiana would contribute cattle to a State sale who would not to a National sale. A great many of us think we have good cattle, but have not thoroughly learned the art of feeding yet to have our cattle compete in a sale of that kind. I think, too, that feeding cattle as these show cattle are fed is detrimental to breeding conditions. I would not care to sell cattle in that condition, but rather sell them in good breeding condition. Of course the best cattle in our State will go to the national sale, but I am in favor of a State sale also.

Mr. Douglass. I think the cattle that are offered for Indiana should be in such a condition that they will be able to compete with the cattle at the national sale in Chicago. I think a sale in Indiana would probably be better for the rank and file of the breeders than a sale in Chicago.

Mr. Robbins: Does any one here know that there will certainly be a sale in Chicago in connection with the show? My understanding is that the Hereford men have claimed a whole week of that show, and I do not think there is a Shorthorn sale contemplated at that show.

Mr. Douglass: I think there is to be a sale of Shorthorn cattle at Kansas City, but that is so far away it will not hurt our sale.

Mr. Ensminger: I think the National Association has appropriated \$5,000 for the sale.

Mr. Smith: My understanding is that the appropriations are for prizes.

Mr. Ensminger: I am for a sale wherever it is held. I got my cattle at the Marion County Breeders' Association, and if it had not been for that Association I should not have the cattle I have to-day. If you wish to benefit the breeders of Indiana let us have a public sale. I know we have good cattle in Indiana, and can have a good sale.

Mr. Christian: I think we should have a sale here. This sale will be for Indiana breeders and for the breeders that belong to this Association. I think we can have a good sale, and that we need not be ashamed of the animals brought into it. Many of our members have only small herds, not enough for just a few of them to make a sale, but in this way we can have a successful sale. I believe the number each breeder can sell should be limited.

Mr. Quick: As chairman of the committee who made the recommendation, I feel like saying a word on this question. We should do that which will be best for the Shorthorn interests of our State. We have considered the question of the sales which have failed and those which have succeeded. If a horse sale is held the animals are put in condition; they are cleaned and handled properly and put in proper condition as to flesh. The question of the sale is one of the most important questions our Association has to consider. There are other questions to be considered after we have decided to have a sale, the question of where it is to be held, how it is to be conducted, what is to go into the sale, what the limit shall be, what the sex of the animals shall be, etc. If we are to have a sale we shall have to decide upon these details. We recommend that the matter go into the hands of the Executive Committee, but they should first know the sentiments of this Association on the subject of how many should go into the sale. Doubtless in the first sale we could make up fifty or sixty head by putting in three each. Let that be the maximum. Of course a man can be represented in the sale by one head. Some one said he would be glad to go into the sale, but he would only have the animals in breeding condition. I believe that should be left also

to the Executive Committee, and they should have full power to say what condition the cattle should be in to go into the sale. It must be in some one's hands to turn down the animals that are not suitable to go into the sale.

Mr. Douglass: Would it not be a convenient time to hold this sale during the State Fair? That would insure having a good State Fair and exhibit for the show; all that would be fitted for the Fair would do for the sale. The sale could be held in the forenoon. The stabling is there, and all preparations are there for receiving the cattle. I believe a small number would be the thing, each one well prepared for the sale, well broken, well handled. Let it be limited to three for each herd, and not more than one of these three to be a bull. If we can get our President to take charge of this sale it would go, and would be a great credit to this State.

Mr. Mitchell: I think it would be a mistake to hold it at the time of the State Fair. The time and space is all taken up then by the regular exhibits. You might have it the week before or the week after. I am sure the idea of a sale is good, but I do not think the Executive Committee should go around to see the condition of the stock. It would be too expensive. No breeder can afford to bring cattle here in poor condition. Then I think they should be allowed to bring as many bulls as they please, provided they are good ones. There is a good demand for good bulls throughout the State. Here at Indianapolis is the place to hold the sale, and the State Fair Grounds are best fitted for it, but not while the State Fair is in progress. I think the very best time of all to have the sale would be in the spring or early summer, for that is the time many people want to get their breeding stock.

Mr. Christian: The important thing now is to set the time of the sale and the number we will put into it. I am in favor of having not less than one hundred head.

President Folsom: This sale is not intended to be a place where breeders can work off their surplus stock. The object is to enable our breeders to bring the Shorthorn to the front. For that reason we would limit the number and the character of the animals. We want cattle offered that will be an honor to the breeder and to the State.

Mr. Quick: This is no joint or combination sale; it is an Indiana Shorthorn Breeders' Association sale, and only members of this Association can enter the sale. For fear that breeders might wish to get rid of surplus stock at this sale, we wish to reserve the right to limit the number which each breeder can enter. I should say the sale should be in June or July, or even earlier. If it is held at that time men from other States will be there to get show animals, and the men who bring good

stock will get the highest prices. It is a breeders' sale we want, made up of the very best bred stock in the very best condition. Professional showmen and professional breeders will be there after them. We want to make such a record that people will be proud to say that they bought their breeding stock at the Indiana Shorthorn Breeders' Association sale. This sale must be held before the first of August or not at all. People who are going to show in the fall will come there, and if you have anything better than they have they will go after it and pay a good price for it.

President Folsom: I do not think there is any necessity for an examination of the stock. No one will want to risk his reputation by bringing culls to this sale. Remember, what you bring here will be taken as a representation of your herd.

Mr. Phillips: I think it would be better to hold the sale before harvest so that the farmers can attend.

Mr. Thomas: If you wish to get breeders from a distance I think a two days' sale would be better than one day.

Mr. Quick: I wish every one would remember that even after the cattle are brought here if they are not in good condition they are liable to be turned down. If we did not limit the sex as well as the number there would be too many bulls. I do not think we had better have 50 per cent. of bulls at that sale.; $33\frac{1}{3}$ per cent. would be better, and one day's sale well put in will be better for the first year. If this proves successful we might have a two days' sale next time. A prize will be offered for the animal bringing the highest price at the sale.

Mr. Macey: I think the time and all the details should be left to the Executive Committee. Only try to steer clear of the Fair, and have a sale for breeders.

Mr. Hammond: I believe we ought to sustain the Secretary in his plea for excellence. In the Kansas City sale some Herefords were brought there by one of the best breeders in the country, and those animals lowered the standard so that they determined hereafter to give the committee a chance to accept or reject cattle.

Mr. Strange: I think the sale would be successful if held as a sort of adjunct to the State Fair. I think most men go to the State Fair with long purses and buy the best things they can find there. People who had this sale in view would be sure to attend despite the distractions of the Fair.

Mr. Robbins: We should not have more than fifty head at the sale. We do not want to make money for any one person. I would have it left

to the committee to say whether the cattle will go under the hammer after they got here.

President Folsom: After corresponding with the breeders, if a large number is offered by each of several persons, we could then limit the number to three; but if fewer breeders offer to send animals we could increase the number, and still keep the number down to fifty or sixty.

Mr. Thomas: I move that the time of sale be left to the Executive Committee, but that it be as near the first of June as practicable.

Motion seconded and carried.

Mr. Quick: I think we should have five on this committee; the Executive Committee consists of only four.

I move that one member more be added to this number to assist the Executive Committee, and that the Executive Committee have the power and be instructed to select such member.

Motion seconded and carried.

The part of the President's message referring to an extra class at the State Fair read and discussed.

On motion it was decided that the report of the committee on this part of the President's address be accepted.

President Folsom: This special class is limited to members of this Association. If a man is not a member of this Association, but wishes to exhibit in this class, he must first become a member of the Association. My idea in that recommendation was to bring forward a class of breeders who were not professional showmen. For some time past the exhibits have been practically in the hands of professional showmen. This is to bring out the good things of our own State. The professional showmen have not all the good things. If a man has but one or two Shorthorns on his place, and one is a phenomenal animal, let us offer some inducement for a breeder of that kind, so that he can have a show as well as the professional exhibitor. We do not want the professional showman to come in and win everything. We want to give the breeders of the State a chance, and we think this is a good way. That was the reason for barring the animal that is entered here for competition in a herd. This is limited to animals under one year.

Mr. Quick: We will get this into the premium list as the Shorthorn Breeders' Association class. Each breeder enters his stock individually, but the prize money is made up and put into the State Fair premium list with the understanding that the prizes are entered under the auspices of the Shorthorn Breeders' Association.

President Folsom: We need not necessarily adopt the rules of the

National Association as to who is a breeder. In making up the rules we should say that "the calves should be calved and owned by the breeder who exhibits." The money for these premiums will doubtless have to come by contributions from the breeders.

Mr. Strange: I move you that this matter be placed in the hands of the Executive Committee that has been named; and that they be instructed that if they can see their way clear to offer these premiums then to go ahead.

Motion seconded and carried.

After some little discussion as to the amount of the prizes to be offered, Mr. Strange and his second asked that the motion just passed be withdrawn, so that he might offer another and more comprehensive one. The request was granted, and Mr. Strange offered the following as a substitute for it:

I move that the matter of prizes, and the amount of each prize, be left to the Executive Committee; that the amount be apportioned according to the amount collected for this purpose by the members of the Association, but that the amounts shall not fall below the list of premiums named in the President's address; and that the exhibit be under the auspices of this Association.

Motion seconded and carried.

Adjourned to meet at 7:30 p. m.

THIRD SESSION.

Meeting called to order by the President at 7:30 p. m.

The discussion of the President's address was continued. The point taken up was in reference to maintaining a department in some agricultural paper in the State.

Mr. Quick: We did not fully recommend this matter. We felt it was a matter that should be left to the Executive Committee of the Association.

Mr. Barrows: I understand that a proposition has been made by an agricultural paper in the State. I would like to have that proposition read. I have been asked to make a proposition.

Mr. Robbins: It would not do for me to say I do not believe in printer's ink, but I have serious doubts as to this being the best thing for

the Association to do. I do not know that it is in a financial condition to do anything of the kind. If some of our papers want to take the matter up and furnish a man to do this work it might be all right; but for this Association to undertake to do anything of this kind would probably cost too much money. I doubt the advisability of attempting anything of the kind at the present time.

President Folsom: The question is whether there would be interest enough manifested among the breeders to maintain a column or department in such a paper. If Mr. Robbins will contribute editorial matter one week, Mr. Hagey the next week, and so on, and when they have anything to sell remember the paper through which they are doing their talking, perhaps such paper would get sufficient remuneration to maintain such department.

Mr. Harper: Such things have been done, and I suppose it could be done now.

President Folsom: Yes; we maintained such a department for three years.

Mr. Hagey: It seems to me there are men enough connected with the Shorthorn interests so that an article could be furnished each week of the year. If we can not plan out some way to remunerate editors or papers for this work, we can surely furnish the other part. I know the department we had in the past was always very interesting. I feel that if we could establish it again it would be very interesting to all Shorthorn men.

Mr. Quick: If it could be done as has been suggested, and we have eighty members now, if we could make the Association's business everybody's business and get each man to contribute something, so that we could have articles in each week of the year, it might go very well; but we, as a committee, looked upon this as not being feasible. We thought that unless there was some special arrangement, some particular person selected for the care of this department, it would frequently go by default. I can speak knowingly on this subject, since we had a department in the Indiana Farmer for three years. I conducted the department and had promises from various members of the Association to help me, which promises were renewed each year. Now, how were these promises kept? Many times for weeks and months I did not get a line from a breeder in the State, and it was only by resorting to clippings from other papers, adjusting them to our breeders in the State, and reporting sales and fairs, private as well as public, that it was kept up and made of interest to the breeders of the State. It requires attention, and attention grows irksome sometimes. You have to have the matter in the hands of the editors at a certain time. This should be made the duty of some par-

ticular person if it is to be a success. I believe the department we had in the Indiana Farmer helped us, and would again, if properly conducted and edited. A good deal of discretion must be used in selecting the manuscript to go into this department, and sometimes a good deal of it will have to be practically re-written.

Our committee looked at it from this standpoint. We did not consider whether we could compensate the editors, but whether the editors of the paper would say that they would compensate some man sufficiently to manage the department for them. The owners of the paper would undoubtedly be well compensated if the matter was of such a nature as to be advantageous to them. If we could get the right sort of a proposition, one that would be of mutual benefit to both the Association and the paper, I believe it would be of advantage, but the matter needs to be considered carefully and conservatively.

Mr. Smith: I think such a department would be very helpful to the Shorthorn interests if properly conducted. I am not prepared to say, however, that we are prepared to conduct it at this time.

Mr. Quick: With all due courtesy to the members of the agricultural press present, I feel that the stock departments have not had the attention that they should have, and particularly as to the breed that is most prominent in the State, the Shorthorn.

Mr. Barrows: We did run a Shorthorn department for three years. We discontinued it because the Shorthorn men did not take enough interest in it. When Mr. Quick was employed on another paper, neither the paper nor the Association supported him. The Indiana Farmer has never refused to publish an article sent in to it that was worth publishing. I never left out an article that was sent in excepting when it would injure the interests of the Shorthorn people and the paper to publish it. We do not want to become the organ of the Shorthorns, or any other breed of cattle, or any other interest. Your contributions, when we did have the department were very interesting, and I am sorry you did not keep it up. Now, why don't you support what you have instead of asking to have some particular paper made an organ? Don't give it all to one. What will you do with the rest of them? Can you sell everything you have through one paper? No: put an "ad." in every one of them and make it pay. Don't sell too cheap. If the Indiana Farmer to-day does not pay the Shorthorn breeders, why do they advertise in it? There has been a change in the proprietorship of the Indiana Farmer. After the first of the new year there will be a new editor on the Indiana Farmer. I hope this will improve the paper; if it does not we will change again.

President Folsom: I am still of the opinion that to reach the farmer, to whom we must look for our markets in the future, we must first

educate him to want our cattle. Can any member suggest any better way than through the agricultural press?

Mr. Billiter's proposition read by the Secretary.

Mr. Barrows: I think that is very unjust to us. This subject was first broached to me to-day at half past one o'clock, when I was asked to make a proposition. Here this letter says, "pursuant to conversation had." Why was not this submitted to me and to other papers?

President Folsom: I do not think any one has accused the Indiana Farmer of not standing by the breeders. I do not think any breeder, or the Association, has had any other view but that the Indiana Farmer has stood by the Shorthorn interests; but it has stood by the Shorthorn as it has stood by the Jersey, by the Hereford, and by every other breed the owners of which paid the Indiana Farmer their money for advertising, or advocating their interests. The question is whether the Indiana Farmer is willing to give a little more attention to the Shorthorn than to any other breed, that we may make it a semi-official organ. We can pay, doubtless, for the columns of any agricultural paper published in the United States, on an equality with all other breeds. If we do not feel like maintaining a paper wholly in the interest of the Shorthorn, we would like to maintain a page in a paper that is not wedded to any particular breed, or one that has a leaning to the Shorthorn. We want a man that is representing a journal, the columns of which we wish to use, to think that way, or think he thinks that way. We want him to make himself a semi-Shorthorn man. This proposition came up recently. I had no opportunity to see the representatives of other papers. We would like to have had something from every other agricultural paper in the State. As soon as this proposition came to my hands I sent for a representative of the Indiana Farmer, and when that representative said he did not want to make a proposition on any terms I did not explain further.

Mr. Barrows: No matter what action you take here you will get just the same support in the Indiana Farmer that you have had in the past. We do not want to be the organ of anybody. The paper is published in the interests of agriculturists and stockmen. We want to support the Shorthorn interests, but we want to support other interests as well. I think you will make a mistake if you make any particular paper your organ. You want every agricultural paper in this State your organ. Our columns are open, and you can get all the articles you choose printed in them. The trouble is that you do not do your duty in this respect.

Mr. Christian: I move that the report of the committee be received and that the matter be referred to the Executive Committee to see what arrangements it can make through the columns of agricultural papers of the State to further the Shorthorn interests.

Motion seconded and carried.

Paper by Mr. Will S. Robbins.

THE SHORTHORN — THE GENERAL-PURPOSE BREED.

W. S. ROBBINS.

I take it, this subject refers more especially to the females, so in the beginning let us ask the question, What is a general-purpose cow? A general-purpose cow is one which will give a reasonable amount of milk of fair quality, and produce a calf which will do the same or make a good carcass of beef, according to the sex, and furnish a large and fairly valuable carcass of beef herself when her usefulness as a breeder is at an end. She is not equal to the best dairy cow of the special breeds at the pail, neither is she equal in beef production to the best beef animals, but she is a cow of fair attainment in producing both beef and milk, and, to use a slang phrase, "can trot in either class." A very great portion of her value is her ability to produce a calf which can be raised at a profit for making beef while she is being milked either for family use or for the purpose of furnishing milk for market, for the cream or for butter, as best suits the convenience of her owner. But her calf is always too valuable to be sent to the butcher as soon as old enough, or knocked in the head and fed to the hogs when first born. In form she should resemble the beef animal and not the dairy cow. She should be large-framed, with a capacious body, a head and neck inclined to fineness and showing marked femininity, but not delicate; she should show marks of vitality by being large around the heart and wide between the front legs, should have a broad, straight back and well-sprung ribs, a long, heavy hind quarter, and stand on short legs, and possess a well-developed udder and milk veins. She may not be so smooth as the typical beef animal, but do not get her too small.

Her place of abode is with the farmer who carries on diversified farming and stock raising, who wants to raise a calf which he knows will bring him a profit for his labor and the feed consumed, and finish the animal thus produced with the products of his farm. Her milk must feed the calf while he is small, furnish the table with butter, cream, and milk, and have some left for the pigs.

The cow we have described can surely be found oftener among the Shorthorns than any other breed, and while we do not claim for every Shorthorn all of the qualities mentioned, they are all contained within the walls of the breed, and it is optional with the breeder which of those points are most prominently developed. This can be controlled by the selection and mating of the breeding animals, the method of feeding and raising the calf when young, and the manner of treatment of the heifer

after calving and during the milking period. That nearly all Shorthorns possess milking qualities of very high order, which can be developed by the above named methods, is our belief, and we know of one herd of about forty cows, all pure-bred and registered Shorthorns, which is handled as a dairy herd, and will compare very favorably with dairy herds of the other breeds as to the production of milk and butter. All the calves are kept on the farm, the heifers used to keep up the females of the herd and the males are either sold to farmers to be used as breeders or are steered and made into first-class butcher cattle. The fact that calves raised in this way are capable of making good steers has been clearly proven by the Iowa Agricultural College, and was demonstrated by the exhibit of skim milk steers, made at the late Omaha exposition.

Thus we have a double profit coming from our Shorthorn dairy, and this is the kind of cattle the general farmer needs and is looking for. Many of the large dairymen of the East are now becoming interested in raising their calves, or, in other words, converting their dairy herds into general-purpose herds, and for this purpose are buying Shorthorn bulls to use on their grade dairy cows, which is very good evidence as to their opinion of the Shorthorn as a general-purpose breed. It is a great thing, though quite uncommon, to start right in breeding. We are not inclined to profit by the mistakes of others, but insist upon learning slowly from our own. While this is in keeping with human nature, it is not in the line of economy. But surely the farmers of Indiana have had a lesson in this respect sufficient to show them that the Shorthorn is preeminently the general farmer's, or, if you please, the general-purpose breed.

DISCUSSION.

President Folsom: Where is the herd mentioned located?

Mr. Robbins: Mr. Phil Nye, of Goshen, owns the herd.

Professor Plumb: The statement was made here to-day that I am a Jersey man. Now, I am a natural lover of live stock, from a fox terrier pup up. It has happened that I have expressed by admiration of the Jersey. I am an admirer of any good breed of cattle. At Purdue we have to have the different types of live stock for two purposes, first, for our students to learn the different types, and, second, for such experimental work as we wish. Our students must work in the dairy for five months in the year. We must produce the milk or buy it. I believe we have specimens of the true beef type, and also of the dairy type. I have made careful trials of all the Shorthorns on our place, so far as their milking capacity is concerned, and have sought grade Shorthorns so that we might have in our herd good examples of the general-purpose cow. I am not authorized to say that Purdue would purchase whatever might be offered, but I will tell you what I would like to ascertain, and it might

be done appropriately through this Association if some member would co-operate with me in interest in this matter. I would like to see at Purdue a fine type of the milking Shorthorn, and if the members of this Association are interested in the matter I would be glad to confer with them and see what could be secured in the shape of a pure-bred Shorthorn cow, one that would be a good type of the milking Shorthorn cow, one we could give a good trial, and publish the results of her capacity in milk product. The students at Purdue who are interested in stock are more interested in Shorthorns than in anything else. Most of them favor general-purpose methods and general farming. If, through the Shorthorn breeders, it might come about that the University could secure for a reasonable sum a desirable addition to our herd, I would be very glad to take steps to secure it.

President Folsom: I think you have advanced an idea that will be fruitful to all breeders of Shorthorns if carried out. If such an animal can be found, and I think it can, and favorable results are secured in that line, it certainly will be to the interests of all Shorthorn breeders in substantiating our claims for them as general-purpose animals.

Mr. Strange: I would like to see one of those animals tested in that way, and handled as you handle them at Purdue. I would like to see one of those animals taken at the right time, and a thorough test made of it.

Mr. Quick: I think Mr. Robbins's paper an excellent one, and I feel every word he has said, because I live near Mooresville, where the Indiana Dairy Association held its meeting last year. In nearly all the dairies there, and almost without exception, the Jersey dairymen are breeding to Shorthorn bulls, because the calves sell better. The fact that calves have grown so valuable accounts for this. I am very glad that Mr. Robbins took this subject for his paper. I think fifteen or sixteen years ago the testing of Shorthorn cows was indulged in considerably. As I recollect, there were prizes offered by the State Fair, and some tests were made. I think, as you have said, that there has been very little publicity given to this matter. Now as the interest has grown for the general-purpose breed, it does seem a good time for our State institution to take this matter in hand.

Professor Plumb: If any animal comes to the University through this Association I should like to have it come through a committee appointed by the Association to act with me.

Mr. Robbins: The trouble with many dairy herds is that they are ruined in trying to make beef cattle out of them.

Professor Plumb: Supposing we had a pair of Shorthorn cows up there and I could say to my pupils that they were sent on the official recommendation of the Indiana Shorthorn Breeders' Association, they

would consider that better than to have an animal picked out of a herd by myself. We could consider those cows as types. This would add interest and strength as presented to the student.

Professor Plumb: I want to say a few words on the subject of tuberculosis. I was born in a State where tuberculosis has created the greatest furor of any State in America—Massachusetts. That State has paid a very dear sum of money for its experience, and some of the other States have reaped the benefit of what Massachusetts has learned. I want to give a word of caution in relation to any excitement that might prevail in Indiana on this subject. I am not a veterinarian and am not expressing the opinion of a veterinarian, but I have followed this work and have made tests of over four thousand head of cattle in Indiana, either with our own veterinarian or by persons employed by him, and we have all the records of these tests in the University. There are extremists in dealing with these matters. Massachusetts adopted an extreme position and had to recede. Conditions there are different from our own. In our investigations here we have found quite a different condition of affairs from that found in those States where the loudest complaints were made. I am delighted to say that Indiana is not a State over which, so far as we know there is cause for general alarm at all. We have only found one and one-half per cent. of tuberculosis among the cattle of the State. Taking all the examinations made, there are herds where we have found a great deal larger per cent., but we have found entire herds where we did not get a single case. We have some very fine records of herds in our State, and we feel proud of the condition, so far as we have gone, of cattle in this State. Some of the herds that have been crowded in uncleanly and unventilated conditions and where brewery grains have been used, the conditions are the worst. But take the average Shorthorn or beef cattle herds in this State, the condition is very favorable for a healthy animal. I believe we should have such laws that they can be properly enforced, and think every stockman should be interested in our having the most satisfactory sanitary conditions. But it is not a case which is going to call for any excitement. I simply give this as a word of caution, so that this Association shall not, in the future, take this question up in an excited manner.

Mr. Quick: I move that Professor Plumb be made an honorary member of this Association. Motion seconded and carried.

Mr. Macey: I move that a vote of thanks be tendered our Executive Committee for the successful arrangement of this meeting.

Motion seconded and carried.

REPORT OF COMMITTEE ON NOMINATION OF OFFICERS.

For President, E. S. Folsom.

For Vice-President, I. J. Hammond.

For Secretary, W. J. Quick.

For Treasurer, E. A. Leavitt.

On motion, the Secretary was instructed to cast the ballot of the Association for each of these officers.

Adjourned sine die.



TENTH ANNUAL REPORT
OF THE
Indiana State Dairy Association

ANNUAL MEETING

HELD AT
Cambridge City, Henry County, December 7-8, 1899.

(Stenographic Notes by A. O. Reser.)
Edited by H. E. VAN NORMAN, Secretary.

TABLE OF CONTENTS.

OFFICERS OF THE INDIANA STATE DAIRY ASSOCIATION.

PRESIDENTS.

C. S. Plumb, Lafayette, Tippecanoe County	1891-1893
Bartlett Woods, Crown Point, Lake County	1893-1894
W. S. Commons, Centreville, Wayne County	1894-1895
C. S. Plumb, Lafayette, Tippecanoe County	1895-1896
O. A. Stubbs, Lewisville, Henry County	1896-1897
S. B. Woods, Lottaville, Lake County.	1897-1898
J. J. W. Billingsley, Indianapolis, Marion County	1898-1899
C. B. Benjamin, LeRoy, Lake County	1899

VICE PRESIDENTS.

Chas. C. VanNuys, Franklin, Johnson County	1893-1894
J. M. Knox, Lebanon, Boone County	1894-1895
W. S. Commons, Centreville, Wayne County	1895-1896
Chas. B. Benjamin, LeRoy, Lake County	1796-1897
O. P. Macy, Mooresville, Morgan County	1897-1898
G. W. Drischel, Cambridge City, Wayne County	1898-1899
J. V. Shugart, Marion, Grant County	1899

FIRST VICE-PRESIDENT.*

D. H. Jenkins, Indianapolis, Marion County. 1891-1892

SECOND VICE PRESIDENT.*

Mrs. Kate M. Busick, Wabash, Wabash County 1891-1892

THIRD VICE-PRESIDENT.*

C. B. Harris, Goshen, Elkhart County. 1891-1892

SECRETARY-TREASURER.

Mrs. Laura D. Worley, Ellettsville, Monroe County 1891-1893
W. S. Commons, Centreville, Wayne County. 1893-1894
H. C. Beckman, Brunswick, Lake County 1894-1897
C. S. Plumb, Lafayette, Tippecanoe County 1897-1898
H. E. VanNorman, Lafayette, Tippecanoe County 1898

OFFICERS AND MEMBERS OF THE INDIANA STATE DAIRY
ASSOCIATION FOR 1900.

C. B. BENJAMIN, President, Leroy, Lake County.
J. V. SHUGART, Vice-President, Marion, Grant County.
H. E. VAN NORMAN, Secretary-Treasurer, Lafayette, Tippecanoe County.

EXECUTIVE COMMITTEE.

C. B. BENJAMIN. J. V. SHUGART. H. E. VAN NORMAN.
J. J. W. BILLINGSLEY, Indianapolis. C. S. PLUMB, Lafayette.

MEMBERSHIP LIST.

ANNUAL MEMBERSHIP.

The following persons have paid one dollar into the treasury for membership in the Association for 1899 since the publication of the last report.

Name.	City or Town.	County.
Bray, W. T. S	Westfield	Hamilton.
Johnson, Perry L	Prairie Creek	Vigo.
Lamont, Mrs. Chas	Joppa	Hendricks.
Linegar, W. A	Huntertown	Allen.
Richardson, O. J.	Lewisville.	Henry.
Rottermund, H. F	Bemis, Illinois.	
Thomas, L. W	Pendleton	Madison.
Wilmore, B. F	Winchester	Randolph.

* In 1893 the offices of first, second and third Vice-Presidents were abolished.

The following persons have paid one dollar into the treasury of the Association for 1900 :

<i>Name.</i>	<i>City or Town.</i>	<i>County.</i>
Anderson, O. C.	Mentone.	Kosciusko.
Addleman, O. D.	Richmond.	Wayne.
Bailor, S. M.	Mulberry	Clinton.
Banks, N. P.	Hobart	Lake.
Barber, H. N.	Westfield	Hamilton.
Bean, John	Richmond.	Wayne.
Beckman, H. C.	Lafayette	Tippecanoe.
Beckman, J. N.	Brunswick.	Lake.
Berkherd, E. R.	Richmond.	Wayne.
Benjamin C. B.	LeRoy	Lake.
Borger, J. H.	Brunswick.	Lake.
Burnside, T. C.	Liberty	Union.
Busick, Mrs. Kate M.	Wabash	Wabash.
Centreville Creamery Co	Centreville	Wayne.
Commons, E. L.	Richmond	Wayne.
Commons, J. A.	Centreville	Wayne.
Commons, W. S.	Centreville	Wayne.
Cook, J. S.	Richmond	Wayne.
Chamberlin & Son, D. J.	Lafayette	Tippecanoe.
Dilling, L. S.	Hagerstown	Wayne.
Drennen, W. F.	Philadelphia	Penn, O.
Doud, Brenson.	Chili	Miami.
Dryden, C. E.	Middle Fork	Jefferson.
Drischel, D. W.	Cambridge City	Henry.
Furnas, R. W.	Indianapolis	Marion.
Gallagher, T. F.	Chicago, Illinois.	
Gilbert, W. J.	New Castle	Henry.
Harris, Chas.	Webster	Wayne.
Harris, J. A.	Owatowna, Minnesota.	
Harris, L. B.	Williamsburg	Wayne.
Hack, J. M.	Crown Point	Lake.
Harvey, J. H.	Carmel	Hamilton.
Henley, E. E.	Straughn	Henry.
Holloway, Silas	North Manchester	Wabash.
Howland, Hiram	Howlands	Marion.
Huntzinger, Munro	Anderson	Madison.
Jackson, T. E.	Centreville	Wayne.
Jenkins, D. H.	Indianapolis	Marion.
Jenkins, Harry	Indianapolis	Marion.
Johnson, F. P.	Howlands	Marion.
Johnson, D. B.	Mooresville	Morgan.
Jones, E. T.	Economy	Wayne.

<i>Name.</i>	<i>City or Town.</i>	<i>County.</i>
Kline, J. Slayton	Logansport	Cass.
Korty, J. N	Lafayette	Tippecanoe.
Knox, J. M	Lebanon	Boone.
Levering, Mortimer	Lafayette	Tippecanoe.
Lybault, J. B	Centreville	Wayne.
Lynn Creamery Co	Lynn	Randolph.
Macy, John W	Straughn	Henry.
Manlove, Geo	Lewisville	Henry.
Maple, J. D	Lewisville	Henry.
Mills, A. H	Mooreville	Morgan.
Mills, O. H	Mooreville	Morgan.
Newby, Herbert	Spiceland	Henry.
Newsom Bros	Valley Mills	Marion.
Nugen, T. S	Lewisville	Morgan.
Raab, Peter	Brightwood	Marion.
Reynolds, Wilson	Dalton	Wayne.
Richmond, D. C	Wheeler	Porter.
Rich, J. S	Richmond	Wayne.
Robbins, Elmer	Liberty	Union.
Roberts, Austin	Westfield	Hamilton.
Roberts, W. H	Howlands	Marion.
Rohe, John W	Centreville	Wayne.
Shaffer, T. A	Hagerstown	Wayne.
Stamm, Levi	Hagerstown	Wayne.
Schlosser, Henry	Bremen	Marshall.
Schwegler, W. G	Lafayette	Tippecanoe.
Shugart, J. V	Marion	Grant.
Scott, D. W	Sugan	Jefferson.
Sudendorf, E.	Elgin, Illinois.	
Stubbs, O. A	Lewisville	Henry.
Stutesman, Herbert	Goshen	Elkhart.
Taylor, S. J	Logansport	Cass.
Van Arnam, M. F	Columbus, Ohio.	
Van Norman, H. E	Lafayette	Tippecanoe.
Waterman, M. H	Ridge Farm, Illinois.	
Welborn, J. M. T.	Bridgeport	Marion.
Wilson, D. W	Elgin, Illinois.	
Willmore, B. F.	Winchester	Randolph.
Woods, S. B	Lottaville	Lake.
Woodyard, Jr., J. F.	Chicago, Illinois.	
Yoars, P. G. & Son	Amboy	Miami.

LIFE MEMBERS.

Name.	City or Town.	County.
Boyd, Jas. A	Cambridge City	Henry.
Commons, W. S	Centreville	Wayne.
Drischel, D. W.	Cambridge City	Henry.
Plumb, C. S	Lafayette	Tippecanoe.
Schlosser, Sam'l	Hanna	Laporte.

HONORARY MEMBERS.

His Excellency, Hon. Jas. A. Mount, Governor of Indiana.
C. B. Harris, Nagasaki, Japan.

SUMMARY.

Active members	91
Life members	5
Honorary members	2
Total	98

COUNTIES REPRESENTED.

Allen.	Henry.	Morgan.
Boone.	Jefferson.	Porter.
Cass.	Kosciusko.	Randolph.
Clinton.	Lake.	Tippecanoe.
Elkhart.	Madison.	Union.
Grant.	Marion.	Vigo.
Hamilton.	Marshall.	Wabash.
Hendricks.	Miami.	Wayne.

Counties represented, 24.

ARTICLES OF ASSOCIATION OF THE INDIANA STATE DAIRY ASSOCIATION.

(As Amended December 7, 1899.)

- Article 1. The name of this Association shall be "The Indiana State Dairy Association."
- Art. 2. The officers of this Association shall consist of a President, Secretary-Treasurer and Vice-President, and an Executive Committee, consisting of the President, Vice-President, Secretary, and two others elected by the Association. The Secretary is authorized, whenever necessary, to employ an assistant secretary of his own appointment, to assist at the annual meeting, who shall be paid for his services as the Executive

Committee may decide. A committee of two, to audit the Secretary-Treasurer's accounts shall be appointed by the President at each annual meeting.

Art. 3. The officers shall be elected to serve one year, or until their successors have been elected.

Art. 4. The regular annual meetings shall occur at such time and place as may be designated by the Executive Committee, or by majority vote of the Association at the annual meeting.

Art. 5. Any person can become a member of this Association for one year by the payment of a fee of one dollar. Upon the payment of ten dollars, a person may become a life member. Honorary members not to exceed five may be elected, but said election is not to hold for over two years, excepting by re-election.

Art. 6. The President shall have power to call a special meeting at such time as in his judgment the interests of the Association demand.

Art. 7. The Executive Board shall have power to transact all unfinished business.

Art. 8. The Treasurer shall be the custodian of all the funds belonging to the institution, and pay out the same on the order of the President. The Treasurer shall also furnish sufficient bond, as determined by the Executive Committee, to guarantee all moneys owned by the Association, handled by him, the said bond to be deposited in such national bank as may be designated by the Executive Committee.

Art. 9. The officers of this Association shall perform such duties as usually devolve upon officers of similar organizations.

Art. 10. The President and Secretary shall each be allowed out of the general fund, an amount equivalent to their actual expenses while attending Association meetings. When the Association receives State aid the Treasurer is authorized to meet the expenses of the Executive Committee in all cases of called meetings where executive business is transacted.

Art. 11. These articles may be amended by a majority vote of the members of the Association present.

PROCEEDINGS OF THE TENTH ANNUAL CONVENTION OF THE INDIANA STATE DAIRY ASSOCIATION.

Cambridge City, Ind., Thursday, December 7, 1899, 9:30 a. m.

The Indiana State Dairy Association was called to order by President J. J. W. Billingsley, of Indianapolis.

After prayer by Rev. F. M. Lacey, of the Methodist Episcopal Church, of Cambridge City, the Association was welcomed to Cambridge City by F. C. Nasbaugh, as follows:

Mr. Nasbaugh: The citizens of Cambridge City desire that I shall express in their behalf their full appreciation of the honor your Association has conferred upon them by holding this meeting in our city. We hope that its influence will be far reaching and of great value both to you and to us. We desire to fulfill every pledge that has been made. We desire to add to your every convenience and comfort during your short stay in our city. Our people are at your service. They have hung out the latch-string. They ask you to enjoy what is ours. The citizens of Cambridge City and the farmers of this community appreciate the progressive spirit and the progressive work that has been done by our townsmen, Messrs. Boyd and Drischel. They have been untiring in their efforts and have succeeded in establishing one of the best cheese plants in Indiana. We feel proud of their achievements, and the large attendance of your Association from all parts of the State is further evidence that you too share with us this pride. To them we are indebted for your presence here to-day. We trust your several sessions may be profitable, instructive and enjoyable. I again bid you welcome and thank you.

S. B. Woods, of Lottaville: In behalf of the Dairy Association of Indiana, I thank you for this kind and cordial welcome. We have been to Wayne County before. We always expect a good deal when we come to Wayne County and we are never disappointed. The number present indicates that we are going to have a good time. We know that Wayne County is a progressive county, that the people are enterprising, wide awake and are willing to come to these meetings and learn from one another. In this way we become better dairymen and dairywomen. Messrs. Boyd and Drischel have taken a great interest in their work and have done wonders in developing the cheese industry of Indiana. I attended the meeting at Centreville, and since that meeting I have always felt that I would like to come to Wayne County again. I feel sure we shall have a good meeting here. I thank you for your cordial welcome.

MIXED FARMING.

T. S. NUGEN, LEWISVILLE.

I hope I may not appear egotistical in discussing this subject if I refer to my own business.

Some eight years ago we started a creamery near my home and I at once became a patron of it, having four cows. Milk was high then, being as much as \$1.10 per hundred. I saw very readily that a cow, together with her offspring, would pay for herself in one year. Not a profit of that much but a gross income for feed and care, approximating closely to her value in dollars and cents. I milk grade Shorthorns, and have been buying thoroughbred males of that strain, with an eye toward the milking qualities of their ancestors.

I have made it a rule to buy no male whose dam did not give forty pounds or more of milk, holding to the idea that my herd would improve in milking qualities and appearance also. I weeded out my objectionable cows, making the standard of merit gentleness, heavy flow of milk and good appearing offspring. At present I have a herd of fifty nearly thoroughbred cows of nice appearance and many good qualities. Our calves are all given a good chance in the race of life, putting two calves to one cow and milking the other. Our calves when very young are taught to eat ground feed. We mix oil-meal and bran with creamery slop and they learn to drink it while sucking. Weaning does not stunt or injure them. This is done at the age of four months.

We separate the steer calves from the heifers, and push them along until they are two years old, at which age they weigh from 1,200 to 1,500 pounds, and for them we receive the highest market price, if well finished. Our heifers are not pushed for fat, but given a good living diet with a desire to develop the growth, and at the age of two years they become cows.

The cows we raise the calves with are fed twice a day, and calves turned in twice a day, which, I think, develops the milking qualities the same as though they were milked by hand. These cows are fed the same as those milked, and each cow can support two calves very nicely. When the calves are weaned other calves take their places or the cows are milked. We aim to keep the flow of milk going as long as it is profitable. The cows are fed twice a day the year round (except when dry) with oil-meal and bran.

During the colder months, ground corn and cob meal are added, together with clover hay and shredded fodder. In the colder months the cows are kept in a warm, comfortable stable during the day time and given warm water, and all stock is housed at night.

HOGS.

Our hogs are fed with creamery slop, oil-meal, middlings and corn, in the following proportions:

For hogs weighing 100 pounds or more, six bushels of corn, 60 pounds of middlings, 20 pounds of oil-meal, mixed with 2 pounds of creamery slop for 100 head. They are fed exactly alike each day, and sold in February and September; spring litters in February, and fall litters in September, averaging at time of sale 300 pounds or more. I believe that if a hog is fed properly he will grow on a paying basis for food consumed until he will weigh 400 pounds or more.

We have heard the remark, "That bunch of hogs is fed out." Concerning young hogs, it is only a violation of natural laws, overloading the bone with too much fat. Nature steps in and demands a halt until time or feed rectifies the mistake. Would it not be much better to feed a balanced ration; that is, a food that would build all parts at the same time and make him a finished product, having size and quality.

Our hogs are kept in bunches of sixty to 100 head, aiming to have even car loads when finished, kept on ground that was mowed the year previous or ground that I wish to corn the following year. Our hogs are rotated the same as grain crops. In this way we guard against disease and distribute the manure, which is valuable. We do not ring, especially young hogs, as I consider that detrimental.

The feed and condition has a great deal to do with their rooting. When a bunch of hogs root badly they are needing something necessary for health which they are not getting. Stone coal and wood ashes are good for hogs in that condition. I wish to emphasize the keeping of hogs on their allotted fields, for I believe this is a great preventive of disease. The hog is only on the ground one year in four and all that is necessary to manage a farm in that way is good fences and water in each field, together with portable cribs and hog houses. Plowing land kills the germs of disease. Permanent pasture is no place for hogs. They injure it and if disease is established it will more than likely follow year after year.

After bad weather commences our heavy hogs are taken to lots having sheds of sufficient size to hold from 60 to 100 head, stalled off so that five to eight can sleep in one stall, thereby preventing overlying. We feed on a platform, saving all the feed. The stalls are cleaned well twice a week and disinfected. Plenty of water is kept by them and they are fed twice each day as described before.

Our fall pigs are wintered over in the fields we intend to plow; having good portable houses, stalled off as mentioned for heavy hogs, of sufficient size to hold the bunch. The manure is hauled direct from the cattle stalls to the field and worked over by shoats. Our shoats are fed every day, as mentioned, and houses cleaned and disinfected weekly.

MANURE.

My paper relates principally to the growing of live stock, for in that branch of farming lies the surest and best profits. It enables one to feed all the farm products, thereby increasing the fertility of the land, raising better crops, and, in time, feed more stock. My idea of rotation of crops is that we should never tend a field in corn but one year, then to wheat, then to clover, letting it run in grass two years, the first year mowing it and the second pasturing it. I also cut clover for seed, feeding chaff to cattle and returning it back to the land in the shape of manure. In manuring land we haul it whenever we have time, commencing at one side of the field and scattering it in strips of about seven steps wide, putting about twelve loads to the acre. We do not skip black ground, but manure solid, considering that we derive as much benefit from manure placed there as elsewhere. Our manure is all placed on ground that is intended for corn the following year. Our stock is fed on this same ground in good weather, that is, from the first of May until the first of December.

The value of manure depends on the kind of feed, as well as the way it is handled. For instance, the manurial value of a ton of oil meal is \$6.00; corn, \$2.00; bran, \$4.00; clover hay, \$1.50; cotton seed meal, \$8.00, showing that the food wherein protein is found most extensively has the most manurial value. In buying these feeds this should be taken into consideration. We aim to manure the land we put in corn, which is generally about 100 acres. We buy all we can and pay fifty cents per load of about 100 cubic feet. I consider one cord of manure worth, when put on land properly, \$1.00, and expect the money back in the first two crops. After that it is like a good man's influence, "never dies."

And now, in conclusion, I wish to say that dairying is the foundation on which to build your future prosperity on the farm. It enables you to breed the kind of stock your fancy may dictate in sufficient quantities to stock your land, thereby furnishing a market for all the hay, straw, and fodder you raise, at good, remunerative prices, keeping the fertility of the farm and making it rich and productive. It gives you the by-product of a factory, which enables you to produce a given number of pounds of pork in half the time it would require otherwise at a greater profit and less risk. It gives you the habit of promptness, cleanliness and thrift—by timely hints from your factory man. It gives you ready cash monthly to meet your obligations, and establishes the cash instead of the credit system in the community and more especially among the patrons of the creamery. It teaches one to care for the comforts of their live stock, for in this lies his profit, building better and larger barns, beautifying his country and becoming of some service to his fellow man and his God.

DISCUSSION.

Mr. Shideler, of Cambridge City: What breed of hogs can you make weigh 300 pounds in five, six or seven months?

Mr. Nugen: I expect the gentleman misunderstood me. I said we sold September litters in the month of September, in the fall, and spring litters in February. I will say that I prefer Poland China hogs.

B. W. Willson, of Elgin: He says they started with four cows and they now have fifty. I ask Mr. Nugen, why he has fifty instead of four.

Mr. Nugen: Well, sir, I thought it profitable to have more, and I am building a barn and expect to have 100 cows.

Mr. Willson: Another question: What success has the creamery had in your neighborhood?

Mr. Nugen: I think it has made a success. I think in our community we have more thrift and more prosperity than before, and that a creamery is of great benefit to the country in which it is located.

Mr. Willson: Why is it that so many creameries in Indiana have not made a success?

Mr. Nugen: When we started our creamery we had a little experience that would have killed us if we had not had a little nerve. I will tell you a little history of the creamery and explain why so many of them fail. We started our creamery and we had no experience. We were hog raisers and beef raisers, and followed everything else except milking the cows, and we did not have any tester in our creamery. We bought our milk and paid for it as it was weighed, and we sold cheese, shipped it to New York, whether it was good or bad, and some of it we never heard of, and the first thing we knew we were in debt \$700. Some of our people wanted to assess the stock and pay it out of that. I do not want to appear egotistical in this, but there were two or three of us that did not like to make a failure of anything, and I said, "We will go to the bank and borrow \$1,200, and be more careful of what we buy, and put in a tester, and see if we can not make a success of this." The board of directors did that. So we bought our milk and tested, and soon we were getting what our money was paid for, and in about a year we had wiped out our indebtedness, and it has been running on a good basis ever since. I think it is a lack of business qualifications which ruins creameries. It is the poor management of the business which ruins it.

Mr. Stubbs, of Lewisville: I live tolerably close to Mr. Nugen, and I notice that he raised a great many pumpkins this year and fed to his cows. I would like to know whether he found the pumpkins beneficial.

President Billingsley: I would like to know whether they give color to the milk.

Mr. Nugen: We raise all that can grow in the cornfield; we plant them with the corn. We feed our cows pumpkins once a day by the wagon load,

given to the herd. I do not believe it makes the cow give any more milk, but I believe it puts her in good condition to go into the winter, especially when pasture is short.

President Billingsley: You don't take out the seeds, do you?

Mr. Nugen: No, sir, we simply throw these pumpkins on the ground, and the cows do not get as many seeds as they would get in a trough.

O. D. Adams, Chester, Franklin County: I rise in defense of the pumpkin. The gentleman has said that he does not believe that the pumpkin increases the flow of milk. I differ with him, decidedly. I run a little dairy in connection with my little farm. I do not farm as extensively as Mr. Nugen does. However, I have a little plat of land I am trying to farm, and try to manage to keep soul and body together, and my family, and we raise a few pumpkins, and while pumpkins may not increase the flow of milk with Shorthorns, they do quite materially with Jerseys. We always milk in the stable, and we know just how much milk each cow gives, and I am here to say that pumpkins, seeds and all, are good food for milk cows, Jerseys in particular. I noticed he wanted a heavy flow of milk, but did not seem to pay any attention to the test his Shorthorn cows would make, which is of very material interest to a man who takes his milk to the creamery, or even churns his own cream into butter. As for the hogs, a gentleman had wondered how Mr. Nugen makes his hogs weigh 200 pounds at from five to seven months old. I have made hogs weigh over 200 hundred pounds at a little less than six months, with plenty of skim milk, shorts, and corn, and plenty of good water. What few hogs I feed I get them out of my way and get my money out of them and bring others on and push and crowd them right through. I think they are less susceptible to cholera, and that is my idea in getting the hogs off early, as early as convenient. Some of my neighbors think I need not be so afraid. However, I have lived seventeen years on the farm where I live now, and there never has a hog died on that farm with the cholera. Since I have lived there, at three different times the hogs of the man adjoining me have had the cholera. Just this fall the hogs of my neighbor across the road had the cholera for nearly three months, and I fed my hogs off and took them away in fine condition. I do not take the chance of cholera by keeping them until they are a year or eighteen months old.

Mr. Nugen: I am aware that I can not get the quality in my milk breeding from a thoroughbred male in the Shorthorn line. But we can improve the flow of milk in Shorthorns some, and we may increase the per cent. a little by selection of the rich milkers.

Mr. Woods: Why have you Shorthorns?

Mr. Nugen: In the first place, I couldn't milk all the cows that would

stock my land, and in having Shorthorns I get animals that will make good beef. If I had a piece of land of 140 or 160 acres, and was making dairying a specialty, I assuredly would have Jerseys or some other animal that would give better milk and as much as the Shorthorns.

President Billingsley: What do your Shorthorns average?

Mr. Nugen: Well, we have cows that give all the way from twenty to forty-five pounds.

President Billingsley: What test?

Mr. Nugen: They test from .03 to 5 per cent.

Mr. Shideler: You use ashes and stone coal for hogs. Is not charcoal better?

Mr. Nugen: Yes, that is very good. I have tried charcoal. I think stone coal, if you have never tried it, would surprise you with its results. They like it as well as corn until they get enough of it.

Mr. Willson, of Elgin: What do you mean by stone coal?

Mr. Nugen: Just the screenings of the soft coal.

DAIRY VS. BEEF.

C. B. BENJAMIN, LEROY, IND.

With the present high price of beef, the average dairyman looks with envy toward the beef cattle breeder and wonders if he is not adding to his wealth a trifle easier than we are. But a few figures may prove the case more plainly.

An average beef cow is worth \$40 and her calf at one year is worth \$20, letting the cost of hay, grain and roughage be offset by mature growth and manure made.

An average dairy cow is worth \$40, and she ought to make one pound of butter per day for nine months, or 270 pounds, worth 18 cents per pound, making a sum of \$48.60. Her calf at one year old is worth \$14. Two gallons of skim milk per day for nine months would be 540 gallons, or 4,320 pounds. This at 15 cents per hundred pounds would amount to \$6.48, making a total of \$69.08 receipts for the year.

Now for the cost of caring for the dairy cow. Allowing twenty minutes per day for care, which is equal to ten hours per month, at 15 cents per hour would be \$1.50 per month. In this computation we make it ten

months because the dairy cow needs attention before and after the regular nine months. Then the care of a dairy cow for ten months would cost \$15, and for the remaining two months \$2, making the total cost for a year \$17.

For her grain ration of feed we will allow ten quarts per day, or a little over nine bushels per month, at an average price of 27 cents per bushel. This may seem high, but it gives a chance to add gluten or bran. Her feed at this price, then, for ten months would cost \$24.30. Add to this the cost of care (\$17) and we find a cost of \$41.30 for care and feed. Deducting this from total receipts leaves a profit of \$27.78, or a gain of \$7.78 over the beef cow, letting the hay and roughage she eats offset the manure made, which is of much higher value, usually, than that from the beef animal.

In this summing up no account has been taken of the buttermilk, which adds a credit to the dairy cow. This same dairy cow as a whole adds 20 per cent. more profit to her owner than does the beef cow.

Then is it a question which is the kind of cattle to breed? As far as the best profits are concerned, we think not.

Yet the location and circumstances under which many of the Indiana cattle breeders are placed cuts quite a figure in which it shall be, dairy or beef. Our idea, however, is, at the present prices of stock cattle of the beef class, it is not the time to shift, especially with the present prices of dairy products.

On the other hand, keep right on raising better cows, making more milk, cream and butter, attend dairy meetings, renewing old acquaintances and making new ones. By thus rubbing together the monotony is broken and the life of the dairyman, while it has clouds, has yet a silver lining.

DISCUSSION.

Mr. Shideler: Will Mr. Benjamin please tell us how he gets eighteen cents for his butter the year round?

Mr. Benjamin: I wanted to be conservative, and I will say here we get twenty cents a pound the year round. Eighteen cents is the average price in our section for creamery butter. We find no trouble in making twenty-cent butter.

Mr. Woods: Mr. Benjamin brought out an idea there which I think ought to be talked about and enlarged on, and that is in regard to shifting. He says that in the present condition of things it would not be wise for a man to shift from dairy to beef. It looks to me as though it is one of the weaknesses of the American farmer to shift from one thing to another. He generally shifts at the wrong time. He shifts from a business that is low to one that is high. It costs a good deal to make the shift, and by the time he gets into the other business it drops down and leaves him in bad

shape. The way for the American farmer to do is to make up his mind what the conditions and surroundings fit him for, what his farm is fitted for, and go to work and do that business as a business, as a manufacturer would. If he is fitted for milking cows and making butter, he wants to make his farm and his buildings and himself in condition to make that milk, and he wants to do it from one end to the other, from beginning to end, and not jump from one thing to the other according to the fluctuations of value. I think that is one of the greatest mistakes we farmers make, as a rule.

Mr. Kingsbury: I would like Mr. Benjamin to state again, if he pleases, the cost of feeding. I don't know that I quite understood him. It seems to me that the cost of feeding his cows is less than what is paid by many other people.

Mr. Benjamin: For a grain ration we allow ten quarts per day, or a little over nine bushels per month, at an average of twenty-seven cents per bushel. We think this is fairly high. For ten months this would amount to from twenty-four to thirty dollars.

Mr. Kingsbury: That would not include clover.

Mr. Benjamin: We let the roughage be offset by the manure. We make no allowance for the rough feed.

Mr. Haycock, of Lewisville: Is this grain ration all corn or all oats?

Mr. Benjamin: We make it a rule to feed what is raised on the farm, grinding the corn and cob together and mixing it with oats. Usually when we can get bran we mix it. It is too high at the present time and we use oats.

Mr. Macey, of Mooresville: I understood that the paper is in reference to the cow. The gentleman only covered the ground in regard to the cow. I want to ask him whether he confines his remarks to the dairy entirely or not.

Mr. Benjamin: The idea was to get at the average difference. I took the \$40 cow, as I considered that an average among the dairy farmers that are present. Very few of us carry \$70 cows.

Mr. Birch, of Cambridge City: I think Mr. Benjamin rather favored the dairy calf too much in his paper. He put the Shorthorn calf at \$20 and the dairy calf at \$14. I think he had better put the Shorthorn calf at \$25 to \$30, and take some two or three off of the dairy calf. I think the proportion would be nearer right and help us beef men out.

Mr. Benjamin: Do you suppose a dairyman before a dairy convention would put the price of beef cattle up and dairy cattle down? Oh, no.

I would say, however, from an average \$40 cow I fail to see where you could get your \$25 or \$30 calf a year old. I believe that extra calves of dairy stripe are worth more than \$14 at a year.

Mr. Macey: I don't belong to the Dairy Association. I am a farmer and milk dairy cows. There are some things a farmer ought to consider before he rushes into the dairy business. I talked with a man who is running a dairy of forty cows, and he said, "I am running out of the Jersey cows as fast as I can. I can not sell them for as much." A farmer ought to be very careful. If he is raising good Shorthorn calves he had better stick to it awhile. I am going to stick to the Jerseys awhile. It depends very much on circumstances. I think the paper is hardly just to the beef breeder, because if we undertake to cover the ground we must allow the beef cattle that bring the highest price on that side to make the balance sheet. I find those men who are raising the Shorthorns to-day are doing it about as easily, or more easily, and making more money than we are.

Mr. Knox, of Lebanon: Just one word in regard to buying a Jersey cow at \$50 and selling for \$15. I don't think it is the fault of the Jersey cow. I think it is the fault of the dairyman. There may be scrub dairy cows, but we have lots of scrub dairymen also in this country.

Mr. Drischel: I would like to ask Mr. Macey if the beef is not on a fictitious basis, and has not been for the last year.

Mr. Macey: Yes, sir.

Mr. Burnside: I would like to ask the gentleman why he brings in the Shorthorn steer into this discussion as the average beef animal of Indiana. I know Jersey cows to be making \$12 a month, and making it for nine months in a year. But they are not the average cow. He is talking about the average beef animal of Indiana. Thoroughbred Shorthorn cattle are not the average beef animal of Indiana. We have not got any in eastern Indiana. They are not the average animal.

Professor Plumb: I want to say a word on the subject Mr. Macey brought up, and that is the Jersey cow. Everything depends on the judgment you use. There is one great misfortune which befell our State some years back, when a lot of cow jockeys were just as industriously working the farmers of Indiana as creamery promoters ever did. These cow jockeys sometimes go down and buy a lot of cows from Jersey herds on the other side of the Ohio River and bring them into our State and sell them at a handsome profit just because the auctioneer says they are pedigreed. If you buy them that is your fault, and the poor cow is not to blame. I can take this audience and show them herds of Jersey cattle in the United States and in the State of Indiana that are magnificent paying

investments. It is true that the Jersey breed as a breed is all right, and because a lot of scrubs of the worst sort are brought into a community, it isn't fair that those samples should condemn the breed. I can go into Farmers' Institutes in the State of Indiana where if I say "Jersey" it is just like waving a red rag before a bull; the people in that community have no use for the Jersey cow. Now, why? Simply because they have not been properly educated to know, first, what a good cow is, and, secondly, because they have not seen any Jerseys. But there are plenty of them. A few years ago the Jersey cow led all the breeds in our State, according to the statement of the State Statistician. Ten years ago the Shorthorn cattle did. I think a large amount of the injury which has been done to the cattle interests of our State has been through the use of these poor, miserable, inferior Jerseys. There are so many of these different breeds in our State that are not milked, and the farmers themselves don't know whether they pay a profit or not. The average farmer feeds his own corn and don't keep any books, and he don't know any more about the results than the milk farmer, and the mere fact that higher prices are paid for beef to-day doesn't mean anything more than the fact that high prices are paid for butter and that it is quoted at 26½ at wholesale and is selling in the city markets at 32. So I say we ought to look at the facts square in the face. If a man has a herd of Jerseys or Holsteins, if he takes care of them in the right sort of an intelligent way he can make money on them, and the more of them we have in Indiana the richer we will be.

Mr. Woods: A beef animal two or three years old is slaughtered, and the well-bred dairy animal at that age is just beginning to be useful and will be useful up to ten or fifteen years old.

Mr. Adams: There are two sides to this question. A man here near me has Shorthorns and I have Jerseys. He has good Shorthorns and I have pretty fair Jerseys. While he has good Shorthorns, that is his business, I have good Jerseys—I claim they are good, because I have plenty of cows that will make a pound a day for every day in the year. This is a dairy meeting. This is not a beef meeting. I have a registered cow that has a little helper calf not higher than the arm of one of these chairs, and it would take three times the amount of money the gentleman specifies in his paper to buy that calf, and I expect if a man should come to buy it my wife would say, "We will keep the calf," and if she says so we will keep the calf. We have not held a dairy meeting in the last twenty years when everybody was not letting loose on the Jerseys. When everybody is changing is the best time to hold on. Three years from now I am going to get a tiptop price for my Jerseys. I am getting a pretty fair price now. I will sell off the culls at forty or fifty dollars a head. My best ones are not for sale. A man came no longer than yesterday and said, "What do you want for that cow?" I said, "She is not for sale." It was not because I am worth so much money that I can afford to keep

this cow, but she pays me to keep her, and when I get an offspring from that cow it is worth keeping. A gentleman over there wanted to know a while ago how a man could get eighteen cents a pound for butter. I laughed way down in my boots at that. I have been dairying some seven or eight years, and there never has been a time I could supply the demand at a quarter. I supply butter to private families in the city of Richmond, and we have some of as fine women in our Quaker City as ever stepped foot on American soil.

Mr. Benjamin: Just one word in defense of the paper. In making my computations I thought it fair to give the beef cattle a net profit of 50 per cent. Is there anything unfair about that? In footing up the figures I neglected to say that our cows gave a net profit for the herd—we are milking eight—last year of sixty-seven dollars per head for butter sold, and the whole profit for the calf and skim milk and all was some sixty-nine dollars. The facts are before you, if the dairy cow pays a profit of 20 per cent. more than the beef cow, as has been shown by conservative figures, why not remain in the dairy business?

Mr. Drischel: With reference to the Shorthorn steer calf and the Jersey heifer calf. At the end of thirty-six months the Jersey cow will have given us two calves, and will bring in fifty to seventy dollars each year after being fresh, while the Shorthorn steer is worth \$66 once.

SKIM MILK FOR PIGS.

H. N. BARKER, LAFAYETTE.

Milk and pigs have long been used for food and articles of commerce, but it is of comparatively recent date the two have been combined as pork, upon our markets. For ages past, farmers and some so-called dairy farmers have allowed the skim milk from the family supply to accumulate and sour, then turn it out to the pigs, to get rid of it and to get it out of the way, rather than make it a definite and regular part of the ration, evidently not realizing the value of it.

October 27, 1898, I commenced feeding a lot of fourteen pigs. These pigs had been running in woods pasture, being fed only a small amount of corn, not receiving enough to keep them in thrifty growing condition. They were at this time about five months old and averaged about sixty to seventy-five pounds. Beginning October 27 I increased the corn to all they would clean up, and began feeding the skim milk. Running at large they would not take very much milk, so November 14 they were

confined to a small lot, perhaps one-quarter acre, and in addition to the corn were fed bran and shorts in equal bulk, with an increased amount of skim milk, cooked pumpkin being fed occasionally. This ration was continued until they were sold. The average daily ration fed from the time the pigs were placed in the pen until sold was eight pounds of corn on the cob, three pounds of bran and shorts, with six pounds separator skim milk, effecting an average gain of \$2.17 at a cost of 3.7 cents daily. The first cost per head was \$2.89; cost of feeding stuffs consumed during feeding period being \$1.71, leaving me a net gain of \$1.18, which was a fair gain, considering the animals fed.

By analysis milk has been found to contain a large percentage of protein, which is very necessary to the growing tissues of the young animal, hence much more satisfactory results may be obtained on farms where both milk and pigs are produced, affording ample opportunity for feeding skim milk during the growing period. In this connection it may be of interest to hear what some of our experiment stations have done in feeding skim milk to pigs.

Of recent years much attention has been given by the Experiment Station to feeding skim milk to pigs. An experiment was made at the Wisconsin Station with 88 pigs of all ages, to determine the value of the separator skim milk in combination with corn meal, the proportion of milk to meal varying from one to nine pounds of milk for each pound of meal. For convenience the results were arranged as follows:

The first group comprising the trial in which not over three pounds of milk were fed with one pound of corn meal.

The second when three or five pounds of milk were fed with each pound of corn meal. Assuming that 500 pounds of corn meal fed alone would have produced 100 pounds of gain with these pigs, we find with the first group 580 pounds of skim milk effected a saving of 179 pounds of corn meal. On this basis 327 pounds of skim milk equals 100 pounds of corn meal when not over three pounds of milk are fed with each pound of meal. Calculating the value of skim milk in connection with corn meal for pigs, feeding according to the proportions fed with the meal, we deduce the following:

When feeding one pound of corn meal with one to three pounds of skim milk, 327 pounds of skim milk saves 100 pounds of meal.

When feeding one pound of corn meal with three to five pounds of skim milk, 446 pounds of skim milk saves 100 pounds of meal.

When feeding one pound of corn meal with five to seven pounds of separated skim milk, 574 pounds of skim milk saves 100 pounds of meal.

When feeding a pound of corn meal with seven to nine pounds of skim milk, 552 pounds of skim milk saves 100 pounds of meal.

The average of all being 475 pounds of separated skim milk equaling 100 pounds of meal.

Several experiments were conducted by Danish stations with centrifugal versus gravity skim milk for pigs. Seventy-two animals were used in these trials, lasting from four to six weeks. Barley, oats, corn and peanut meal were fed separately or combined. In all cases skim milk was given in addition to the grain. The pigs were all less than twelve weeks old, averaging six weeks and weighing less than forty pounds at the beginning of the trials. The pigs in these trials were fed about eight pounds of milk a day on an average. Of gravity skim milk 100 pounds produced a little over four-tenths of a pound more gain in live weight than the same quantity of centrifugal skim milk. Those pigs fed gravity skim milk gained as much in twenty-three days as the others in twenty-four days. Allowing a fair value for butter fat, centrifuging the milk is seen to be the most profitable method. In 1887 some valuable experiments were made as to the relative value of skim milk and whey left from the manufacture of skim milk cheese made from separator skim milk.

In one series where three pounds of whey were fed against one pound of skim milk, the weight of the pigs fed averaged from seventy to ninety-five pounds. These trials included thirty-four animals, the feeding lasting fifty-three to sixty days. There was a daily gain of ninety-one hundredths of a pound for the lots fed skim milk and one and twenty-two hundredths pounds for those fed whey.

Another series of experiments were conducted on six different farms, with 258 animals in all, varying in weight from twenty-eight to seventy-four pounds each at the beginning of the trials, the feeding periods running from fifty to sixty days. In these series, which included nineteen trials, two pounds of whey were fed against one pound of separator skim milk. The average gain of the animals in both lots was exactly the same, being one and thirteen hundredths pounds daily. The conclusion drawn is that one pound of separator skim milk equals two pounds of whey obtained in the manufacture of skim milk cheese. Such whey is necessarily free from fat, and consequently has the lowest feeding value whey can possess. These results were corroborated in 1887 and 1888 as well as by still later trials. The results of investigation at the Wisconsin Station and at Ontario Agricultural College as to the value of whey obtained from the manufacture of full cream cheese, for pigs show that 1,398 pounds of whey saved 1.78 pounds of grain. On this basis, 785 pounds of whey equal 100 pounds of grain. This shows a much higher feeding value for whey than shown by the Danish experiments.

The reason for this is that in American trials the whey contained more fat and probably more casein than that fed at the Danish stations. The feeder wishing to know the money value of skim milk, measured in corn, will find the following table of value:

When corn is twenty-eight cents a bushel and feeding one to three pounds of skim milk to one pound of corn meal, 100 pounds of skim milk has a value of fifteen cents.

When feeding seven to nine pounds of skim milk against one pound of corn meal, 100 pounds of skim milk is worth nine cents. These are only the results of experiments made in other States and other nations, and perhaps represent only a small percentage of the gains that may be realized from feeding skim milk to pigs in our own State, when conducted by the members of the Indiana State Dairy Association.

DISCUSSION.

Mr. Nugen: I would like to ask the gentleman whether it would not be better to mix some feed with the skim milk and not feed it alone, as for instance oil meal, and make a thick slop out of it.

Mr. Barker: I do not think the milk should be used alone, especially the skim milk.

Professor Plumb: I would like to ask Mr. Drischel if the whey he makes in his cheese factory is used in feeding pigs or any other stock.

Mr. Drischel: The use of whey through the summer months is not good, on account of the warm weather making it sour. If we could hold it in good condition or Pasteurize it so it can be fed to pigs it is a good feed. I can candidly say, and the farmers here will bear me out, that during the fall and winter months they are glad to get the whey. Fed sweet it produces good results when given to pigs with dry feed. We think during the fall and winter months it is just as good as sour skim milk, if not equal to sweet skim milk.

Mr. Stubbs: Mr. Nugen has had practical experience along these lines. His farm lies just across the road from our factory in Lewisville, and he feeds from 400 to 600 head of hogs a year. I would like to hear him say something about his experience.

Mr. Nugen: Along in the winter of 1892-93, I bought a bunch of hogs in October, and weighed them on the 22d of October. There were ninety-two head of them. They weighed fifty pounds apiece, and ten pounds over in the bunch. I fed those pigs pumpkins and creamery slop, and, by the way, this was whey I fed them. I was getting the whey, I think, at Cambridge, and hauling it from here, or New Castle, one of the two; I don't know which. I fed those pigs the first six weeks on creamery slop and pumpkins. I did not give them any corn. Then I began to work corn into that feed. I fed oil meal and middlings all the time with the slop—made it pretty heavy—about thirty pounds of middlings and ten pounds of oil meal, mixed with barley slop. I kept those pigs until the 5th day of April. On the 5th day of April I sold them, and they weighed 302½ pounds. It was 187 days I fed them and the growth was 252½ pounds to the head, on an average for the ninety-two head. Ever since that time

I have considered whey a pretty good material for hogs if fed with other food. Of course, as the gentleman says, if it gets too sour it is not so good. But middlings and oil meal will sweeten up pretty sour swill, or at least will sweeten it up so it will not hurt the hog.

Mr. Drischel: We turn out from thirty to forty hogs every six months. We feed nothing but whey and a very little corn in the morning and evening until they weigh about 150 pounds, and then we commence giving them corn, and that brings them up to 250 or 300 pounds weight. The whey keeps them in good condition, and with the addition of corn they build up rapidly.

A Member: Do you mean to say you give them nothing but whey?

Mr. Drischel: We buy sixty to seventy-pound pigs and feed them whey, with a very little corn, probably a bushel basket full to 30 or 40 pigs in the morning, and probably the same in the evening, until they weigh 150 pounds; then we crowd the corn in.

Professor Plumb: I think it would be a good idea to have an expression from this audience as to how many are patrons of creameries or cheese factories and who make use of whey in feeding stock.

A vote is taken and it was shown that twenty-six in the audience fed whey and skim milk to pigs, and thirty-three are patrons of a creamery.

Mr. Burnside: I would like to ask the creamery men here if they have had any experience in feeding sweet skim milk to their milch cows.

Mr. Nugen: As for feeding sweet skim milk to milch cows, I have nothing to say, but the creamery is across the road from my place and a great deal of the slop comes over there and so we put in a tank to catch it, and our milch cows go to this tank. There isn't one of them but will drink it. There isn't a thing on the place but will drink and eat it, and if there is any substance in that slop you can notice it very quickly in the increase in the milk. It will affect them as much as any other food which you can give them, and I think it is worth just as much money for cows as it is for pigs.

Mr. Burnside: I asked that question because I wanted the information. I unfortunately lost my hogs with the cholera. I have not a hog on the farm for the first time in my life, and I have a good deal of milk to carry to the factory, some 200 or 300 pounds a day, and I have been using that milk, get it warm now this cool weather. I have only two miles to go to the factory. I have been wetting down the shredded fodder, and the cows eat it regularly and do well. I have been fearful that in time it might stop the cows from giving milk at all, and I wanted to know if you old creamery men had any experience feeding skim milk to cows.

Mr. Van Norman: Do you have any trouble in getting them to eat?

Mr. Burnside: I have eighteen cows. Two, in the beginning, made a little fuss, but afterwards they ate it heartily. I put corn-cob meal and bran on that shredded fodder. They seemed to like it and it seemed to increase the flow of milk a little.

Mr. Kingsbury: I would like to ask Mr. Nugen to give us the average cash cost per day of feeding a cow giving milk, supposing you had to buy the feed?

Mr. Nugen: A great deal of my feed comes off the farm. I would hardly know how to estimate the price of all of it, and then the cost of the materials we feed varies so it would be a pretty difficult matter with me to give the exact cost of keeping a cow, but I would judge from what accounts I have kept, that it would take about \$25, counting the hay and fodder at about what I could get for it on the market.

Mr. Kingsbury: That would be less than 10 cents a day—about 7 cents a day. I have here an estimate made by some one writing on the subject, which gives the figures for everything—bran, cotton-seed meal—you have four or five different kinds of rough feed, the clover hay first, then corn stover, oats straw, then corn meal, bran, and cotton-seed meal, and as nearly as I can figure the value of these items, the cost of feeding a cow per day is 16 cents, where everything is bought and paid for in cash. If you are correct, your business is much more profitable than it is in the case of this writer.

Mr. Woods: In regard to feeding milk to the cows, I think it is a capital idea to give the newly calved cow some of the first milk. I have practiced it some and it seems to me it is the best thing to give her, and where she is inclined to be weak or need nourishing food I continue this until she gets strong. I have a cow that had a little mishap; she was run down, and I gave her all the milk she gave, and she is picking up faster than she would on any other food, and where a cow is sickly it stands us in hand to get her well as quickly as possible.

President Billingsley: I know a dairyman or two who have tried that, and they say they don't have any trouble with the milk whatever.

Mr. Van Norman: On the question of the cost of feed; I figured it the other day on one of our big Holstein cows. We were feeding her 12¼ cents worth of grain a day, and she made one and one-half pounds of butter, which is worth to us 30 cents. We increased it to 21 cents worth of grain a day, and she made us 40 cents worth of butter.

Mr. Woods: Which made the greatest profit?

Mr. Van Norman: Oh, the largest feed.

Mr. Willson: Would that indicate richer milk or more of it with the larger feed?

Mr. Van Norman: More of it.

Professor Plumb moved that the President appoint a committee of three persons on revision of the Constitution and By-Laws. Motion carried.

Mr. Benjamin moved that the President appoint a committee of five on resolutions. Motion carried.

Mr. Drischel moved that the President appoint a committee of five as a legislative committee. Motion carried.

Mr. Stubbs moved that the President appoint a committee of five on nominations. Motion carried.

The convention adjourned at 12 o'clock, noon, Thursday, December 7, 1899.

AFTERNOON SESSION.

Cambridge City, Ind., December 7, 1899, 1:30 p. m.

President Billingsley announces the appointment of the following committees:

Committee on Resolutions: C. B. Benjamin, W. S. Commons, G. P. Newsom, J. M. Knox and O. H. Mills.

Committee on Nominations: O. A. Stubbs, Samuel Woods, J. V. Shugart, W. H. Roberts and P. C. Burnside.

Committee on Legislation: Dr. Woollen, G. W. Drischel, Prof. C. S. Plumb, Frank P. Johnson and D. B. Johnson.

Committee on Revision of the Constitution: Prof. C. S. Plumb, H. E. Van Norman and C. B. Benjamin.

D. L. Richmond is permitted to explain a feed trough of his invention to the convention.

The Treasurer made his report, which, on motion of Professor Plumb, was referred to the Auditing Committee. (See report in back of these proceedings.)

SORGHUM, OATS AND PEAS.

S. B. WOODS, OF LOTTAVILLE, LAKE COUNTY.

Every dairyman that is up to date in the care of his cows has to have what is called a balanced ration, and to make a profit on milk he must have that balanced ration produced or bought cheap enough so there will be a margin between the cost of the making and selling price of the dairy product. I will admit that corn is king, and I will not try to dethrone corn. Corn, I think, is the main crop in a dairy ration, as bread is the staff of life. But cows can not live on corn alone, and give milk, any more than people can live on bread alone and enjoy good health. Therefore we must raise something on the farm that will help to make a balanced ration, and that will suit the appetite of the cow. I think a cow abhors corn all the time the same as a person abhors white bread all the time, or meat of one kind all the time. Therefore, I grow sorghum to give a variety more than as a balanced ration. The fact is, as I understand it, that sorghum has the same composition as corn. But the cows seem to like the sorghum in connection with corn. I commence in September, when the sorghum is fair size, or even before, and feed part corn and part sorghum. This variety seems to suit and agree with the cow. In growing this sorghum I select the poorest place on the farm, because the sorghum grown on rich ground will grow to such a height that it will fall down, and after falling down it is hard to manage. Planting it on poor ground, it grows big enough, and strong enough, and heavy enough, to make a good big crop for the cows, without falling down. I cut it with a Deering harvester, and a Deering harvester will take a row at a time, and bind up and throw off the bundles, where it is standing up nicely, just as nicely and as easily as a grain binder will cut, bind and throw off good standing oats. It does it so nicely that I had a photograph taken of the machine when I was cutting. I will show it. If you are feeding the cows rather heavily with corn, they won't eat the butts of the sorghum. If you take out two or three shocks of corn and a shock of sorghum, you won't find any sorghum after a little while. They will leave the corn for the sorghum. I plant the sorghum, putting the seed in with a two-horse corn drill, with the same disc or plates I use for drilling corn, and it plants it thick. But it will grow thick and good, and it takes such a strong growth after it is started that, if any small weeds start, the sorghum will choke them out. So it is not hard to raise. I drag it before it comes up and cultivate it some. The sorghum is such a powerful root crop that it don't give the weeds a chance on land suitable for growing sorghum.

As to peas and oats. I presume the Secretary, in putting me down

for this subject, had reference to the Canada pea and oats grown by us as feed for cows. I sow the peas as early as possible in the spring. I first disc the land thoroughly and plow the peas under four inches deep. In sowing peas broadcast on level land, they roll so easily, they roll in a bunch, where, if you have it disced and rough, they will stay where they fall. I plow them under about four inches deep, and then sow the oats on top of that and thoroughly drag it in, drag it down good. That is all there is about sowing peas and oats. They grow strong and rapidly. We haul this out in the dry time in summer, when the pasture is short. It is a great milk producing feed, and the cows like it. I cut it and bind it up and stack it and thresh it, and then grind the peas and oats together as meal, and it is a right good balanced ration, with corn. Sometimes the pea vines have a tendency to break the oats down in the field. You don't want rich land for oats and peas, as they will grow to such a height they fall down, and that makes a bad job of it. I have some poor, sandy land on the north end of my farm, which was not productive to grow anything but sand burrs, until I got the southern cow pea. I planted it in the sand and it made a fine growth. We plowed it under and the next year planted sorghum, and it grew remarkably well on the land where the cow peas were. You can see to a row where the peas were planted the year before and where they were not. So I consider, as a fertilizer and builder up of land, the southern cow pea is superior to anything I know of.

DISCUSSION.

Mr. Shafer: I would like to ask Mr. Woods whether he feeds his sorghum whole, as it comes from the binder to the cattle, or does he run it through a feed-cutter?

Mr. Woods: We feed it whole. If the ground is dry we feed it on the ground. If the ground is muddy and wet we put it in the manger in the stable. We feed everything outside as long as it is comfortable for the cows, and when it is not we put them in the barn and keep them comfortable.

Professor Plumb: Do all your cows eat sorghum equally well?

Mr. Woods: Yes; I never noticed any of them going back on it.

President Billingsley: Do they eat peas equally well?

Mr. Woods: I think they do.

Mr. Willson: Do they eat sorghum as cleanly as they do corn fodder?

Mr. Woods: More so; but I will say I make it an object not to plant more than they will eat up by Christmas, from the fact that the sorghum

is full of sweet juice, and hard freezing weather will turn it black, and it is not as good afterwards. I think I prefer having corn stalks after Christmas or hard freezing weather. The leaves and tops are all right, but the butts, where they have the sweet sap in them, are hurt to a great extent by freezing.

President Billingsley: Have you ever had any trouble with your stock in feeding sorghum?

Mr. Woods: No, sir. The only trouble is they give an awful lot of milk. Let me correct that. I did. I had this same ridge I spoke of planted in sorghum, and I turned the cows in, and I told my boys to get them out in about an hour or two and not let them eat too much, and they forgot it and did not get them out for two or three hours, and the next day those cows looked as though they were sick. It did affect them badly, so it is a good plan to be careful. It is not safe to turn them into it, but by taking it to them we do them good.

Professor Plumb: Is there anybody here who has ever fed sorghum, or tried to feed sorghum, and the cattle would not eat it?

Mr. Elwood: We commenced feeding sorghum two years ago this fall, when it was rather young. It was too thick, and we thinned it out, and on tasting it we found it was bitter. The sweetness had not come into the sorghum, and the cattle would eat sweet corn, and would hardly eat the sorghum at all. But we waited awhile, until the sweetness came into the sorghum, and then we found the cattle would eat it in preference to anything.

Mr. Perry: I would like to ask the speaker, when he sows his oats and peas together, if he sows them about the same time in the spring that we usually sow an oats crop.

Mr. Woods: I believe I said I sow them as early as the ground is in a condition to work. I at first sowed the peas about a week before I sowed the oats, but I found, in doing that, that the peas got ripe before the oats. I want the peas as green as the oats, because if they get ripe before the oats are fully matured they will shell out in handling. I find they mature together about right.

Mr. Elwood: I would like to ask, if you sow the oats on top of the ground and drill the peas in deep, if the drill would not answer the purpose as well as plowing them under.

Mr. Woods: I think so, but the drill I tried cracks the peas—splits them. The drill I used split the peas to such an extent I thought it was injurious.

Mr. Beane: I would like to ask Mr. Woods whether sweet corn would be more profitable for soiling than sorghum?

Mr. Woods: As I said, I think corn is the main crop, but I use the sorghum as a variety. I think cows, like people, are fond of a variety. I think the greater the variety the better, and I advocate the planting of sorghum and the sowing of peas and oats as a variety, to get a balanced ration.

President Billingsley: I would like, with the consent of the convention, to give you very briefly my experience with sorghum. I sow the sorghum as early as the ground is in condition. I take a great deal of pains to make it fine, and I occupy the ground, if possible, that is practically free from weeds. I take a two-horse drill and drill it in, just as I would drill wheat or oats, about one and a half or two bushels to the acre. When sorghum first comes up it is a slow grower for the first two or three weeks. After that it grows very rapidly. While it is small, if any weeds appear, large weeds that are likely to be in the way, I pass through and have them pulled out, or pull them out myself. There will only occasionally be a weed. It is very easily done, and that is all I do to it in the way of cultivation. When it is three or four feet high I cut it and begin to feed it; it is very thick on the ground; it is like a dark cloud almost, and I continue to feed it until I feed that off. After you cut off the first crop, if the season is favorable, in the course of a month, or such a matter, you will have another crop you can commence on—the second growth. I have cut off the second growth, and have had a third growth, one season when it was very favorable. I don't know of anything you can grow that you can get more out of it in the way of feed than sorghum.

Mr. Woods: Do you think there is nutriment in that young stuff that will warrant the growing of it that way?

President Billingsley: The milk return satisfies me, and that is what I am after.

Mr. Willson: Did you ever test your milk, to find out whether it was a ration for producing rich milk or not?

President Billingsley: I believe it is pretty generally believed you can not change the richness particularly by feed one way or the other.

Mr. Kingsbury: Do you mean to say that you would get just as rich milk from cows fed on the marsh hay in the north part of the State as if they were fed on sorghum or sugar corn?

President Billingsley: I am going by the experiment stations. I believe they are pretty generally agreed, if you can make any change at all, it is so small it can not be depended on. That is my understanding of it.

Mr. Kingsbury: I would like to hear Mr. Woods on that.

Mr. Woods: I believe a cow is born to give about such a quality of milk. You can increase that quantity, but you can not regulate the quality of the milk by the feed. I had a herd of thirty cows which were treated just alike, and by the Babcock tester one cow gave 2 per cent. of butter and the other cow 7.4 per cent. If it was the feed, why didn't they all give the same quality of milk? They varied according to the cow. It is the cow which regulates the richness of the milk, and the feed that regulates the quantity of milk.

Mr. Kingsbury: Then why not feed prairie grass? It would not cost so much.

Mr. Woods: Then your cows would not give so much milk. This summer I took my cows off the good pasture, and thought I would get a cheap pasture. I put them in a wild grass pasture, where the grass was up to their backs, and they were full as ticks all the time, but there wasn't strength in it to make milk. It seemed to only make manure. The cows were full all the time, but there was not enough nutriment in this pasture to make milk to any extent.

Professor Plumb: It might interest this audience to hear one or two little experiments. Professor Wing, of Cornell University, took a herd of Jersey cows and fed them quantities of tallow, to see if it would affect the butter fat in the milk. They were fed gradually increased quantities of it each day, and then the amount was decreased. They were fed this tallow, I think, a period extending over ninety days, and the result of the feeding of this tallow was to show that it did not affect the milk at all. The butter fat was not affected one way or the other. Then Professor Jordan, of the New York State Experiment Station, had some material sent to him from Chicago that had all the fat removed. It was food that was practically free of all fat. You know that all grasses and growing plants have more or less fatty material in them; and the question was, How would it affect the fat in the milk, if feed of this peculiar character was fed? It did not affect it one way or the other. The cows went on making the fat in their milk, as though they were fed just the same as they would be fed under ordinary conditions. Some years ago Professor Patrick, of the Iowa Experiment Station, tried the experiment of feeding sugar mill feed for a time, and he got a slightly increased amount of fat in the milk over what he got before, and he came to the conclusion that

probably the amount of fat in the milk might be affected somewhat by the feed. Then later he repeated that experiment and fed sugar mill feed, and also other foods rich in nitrogenous material, and he did not get the same results, and, generally speaking, as the President has said, the experiment stations of Europe and America have not been able to feed fat into the milk or to change the character of the milk in any way.

Mr. Harris: I saw an experiment made by a neighbor of mine. It was made through carelessness. He was milking some thirty-three cows. During the full flow of milk in the summer, his test averages a little below 4 per cent. Cold weather came on. His cows were housed by a wire fence and lay by a strawstack. He just stripped the cows, and he used to bring to the factory about seventy-five pounds of milk which tested 9 per cent. If you want to increase the fat in your milk, you want to house your cows by a wire fence, and turn them out to a strawstack on the cold prairie. Under such circumstances I will guarantee that the milk you get will have a high test.

Mr. Macey: I would like to ask the President how he harvests the sorghum when he sows it thick that way.

President Billingsley: Just use the mower. There is no difficulty about it.

PLACE OF CORN FODDER IN THE FEEDING RATION.

PROF. T. F. HUNT, COLUMBUS, OHIO.

All plants are similar. All plants or parts of plants, such as the seeds or the stems, and all by-products of plants, consist of certain nutrients or groups of nutrients. To enable comparisons to be made, the chemists have agreed on a fairly uniform method of analysis and uniform nomenclature. Hence it is customary in analyzing to state the percentage of water, ash, protein ($n \times 6.25$), crude fiber, nitrogen-free extract, and fat (ether extract) which each contains. All foods of the character just mentioned, contain all of these nutrients or groups of nutrients, but the difference in appearance, which is so marked between the different plants or parts of plants, is due largely to the difference in the proportion of the several nutrients.

The one nutrient or group of nutrients which makes a marked difference in the character of plants or parts of plants is crude fiber, composed

of cellulose, lignose and allied products. The following table serves to show the difference in the amount of crude fiber contained in what we call coarse fodders or roughage and the grains or concentrates:

POUNDS OF CRUDE FIBER AND ASH IN EACH 100 POUNDS. WATER-FREE SUBSTANCE.

	<i>Crude Fiber.</i>	<i>Ash.</i>
Wheat straw	42.1	4.6
Oat straw	40.7	5.6
Timothy hay	33.5	5.1
Corn stover	33.0	5.7
Clover hay	29.1	7.3
Blue grass pasture	18.3	9.2
Oats	10.8	3.4
Linseed meal N. P	10.5	6.5
Wheat bran	10.2	6.6
Barley	3.0	2.7
Corn	2.4	1.7
Wheat	2.0	2.0
Gluten meal	1.6	0.7

It will be seen that, as a rule, roughage contains between 25 and 40 per cent. of crude fiber, while the true seeds seldom contain more than 5 per cent. of crude fiber. The oat hull increases the percentage of crude fiber in the oat, but the hull doubtless acts as an equal amount of cut straw would when mixed with corn meal.

Probably the digestibility of the true seed or oat kernel is not materially affected thereby. The oil in the case of flaxseed and the starch in the case of wheat having been removed, the crude fiber of their by-products, linseed meal and bran, have been increased.

Attention should also be called to the difference in the ash constituents of roughage or coarse fodders, as compared to the grains. It will be noticed from the table that coarse fodders generally contain more than 5 per cent. of ash constituents, while the grains generally contain less than 3 per cent. It should be further noted that, while the grains contain an excess of phosphoric acid and a deficiency of lime, the coarse fodders contain an excess of lime, but a deficiency of phosphoric acid. Thus, when we feed coarse fodders only, we may have a deficiency of phosphoric acid, as in the case of cattle wintered at a straw pile, while, when fed grain alone, we may have a deficiency of lime, as in the case of hogs fed on Indian corn alone. It is entirely possible that calves fed upon skim milk and grain, without coarse food, might suffer for the lack of proper bone-making material. A case came to my attention where a number of calves fed on gluten meal, without coarse feed, denuded the locust trees in the grove, where they were allowed to roam, of their bark as far as the calves could reach. A glance at the table shows that gluten meal contains almost no ash constituents, and there is no doubt in my mind that the bark was eaten to supply the deficiency.

The principle ingredient of crude fiber is cellulose, which is identical

in composition with starch of nitrogen-free extract. The process of digestion of cellulose is by no means thoroughly understood, but it serves, when digestible, the same purposes in the animal as does the starch. Generally speaking, a little more than one-half of the crude fiber of our hays and straws is digestible, while from eight to nine-tenths of the starch of the grains is digestible. About 20 pounds of crude fiber in each 100 pounds of wheat straw is digestible, while 65 pounds of the nitrogen-free extract (in this case principally starch) in each 100 pounds of Dent corn is digestible. As the composition of starch and cellulose is identical, and as their function and purposes in animal economy are identical, the thesis of this address is whether the starch in nitrogen-free extract may replace crude fiber without injury to the health or development of our domestic animals, and, if so, when and under what conditions is it wise economy to do so? Or, to put it in other words, is the habit of eating roughage by our domestic animals a constitutional habit which is imperative? It should be stated, at the outset, that this discussion applies especially to cattle, although in some measure to sheep and horses, but does not apply to swine.

The digestive capacity of the pig is quite different from the other animals named, and conclusions drawn from these classes can not apply to the former.

In the state of nature, herbivorous animals, which include our horses, cattle and sheep, lived exclusively on coarse fodders, principally grasses in all stages of maturity. They did not have corn, oats, barley, or any other grains, much less the by-products, such as bran and linseed meal, which we now feed so extensively to milch cows, and somewhat to other classes of animals.

Herbivorous animals were evolved out of the conditions which surrounded them in the state of nature, and one of these conditions was the necessity of consuming what we term the coarse fodders. Had we any doubt upon this subject, we have but to study the digestive tract of the ruminants, to which cattle and sheep belong, and we will find the four stomachs admirably adapted to the reduction and finally the digestion of vegetation. We may rest assured, therefore, that our domestic animals are remarkably adapted to the conversion of the coarse fodders of the farm into substances of value to mankind. It must be admitted, and I wish here to emphasize it, that the coarse fodders constitute much the largest of soil products, and, without the use of our domestic animals, these products would be largely valueless.

It may be of interest to pause here long enough to speculate what sort of a feeding ration nature furnished the wild cow during the spring and summer, when she was suckling her young. We show below the number of pounds of dry matter which a cow would be compelled to consume in the blue grass pasture in order to obtain 16 pounds of digestible substance, and also the number of pounds of dry matter in mixed pasture grasses to

obtain the same amount of digestible matter. For the sake of comparison we give the German standard for feeding milch cows giving 22 pounds of milk daily, and also the ration that the Ohio State University uses with its dairy herd:

	<i>Dry Matter.</i>	<i>Digestible Matter.</i>	<i>Digestible Protein.</i>	<i>Nutritive Ratio.</i>
German	29	16.6	2.5	1:5.7
Ohio State University	24	16.0	2.0	1:7.0
Blue grass pasture	22.13	16.0	1.9	1:7.4
Pasture grasses (mixed)	23.53	16.0	2.94	1:4.4

While there is a wide variation in the proportion of digestible protein to the non-nitrogenous digestible substance, the coarseness of the food is substantially the same. To get 16 pounds of digestible substance requires the eating of less than 24 pounds of dry matter when animals are on pasture.

Reference to the former table shows that Kentucky blue grass contains much less crude fiber than much of the roughage which we feed. In the state of nature, as the season advanced, grasses would be somewhat more mature, and, consequently, more dry matter also would have to be eaten in order to get the required amount of digestible substance. In nature, the animal becomes fat during the season of plenty and good quality to furnish it a reserved force which enables it to pass through the period of unfavorable weather and food supply. If there is anything, therefore, in constitutional habit, this would indicate that it was not according to nature to have animals subsist on straw or hay alone, and, further, that it is not in accordance with nature to have an animal for its best productiveness to consume a ration which was less than two-thirds digestible.

It is not what an animal eats, but what it digests, that is of value in supporting the various functions of the body. What it fails to digest is inert. It is outside the body, for all intents and purposes. There is by no means a fixed relation between the pounds of digestible nutrients a food contains and its value, as will be hereafter shown, but there is a much closer relation than there is between the pounds of dry matter, not to mention the pounds of fresh substance. The following table shows the cost of digestible nutrients in some of our common foods, at an ordinary price, and also the pounds of digestible nutrients in each 100 pounds of dry matter:

	<i>Market Price per Cwt.</i>	<i>Cost of Digest- ible Substance.</i>	<i>Pounds of Dry Matter Digested.</i>
Wheat straw	\$0 10	\$0 27	43
Timothy hay	45	90	57
Corn ensilage	10	48	64
Corn stover	10	28	60
Clover hay	30	68	60
Oats	72	99	70
Linseed meal, N. P	1 25	1 69	80
Wheat bran	75	1 31	62
Corn	50	62	90
Gluten meal	1 10	1 17	87

This table shows a number of things. It shows that at a ruling price for the several foods the digestible nutrients range in cost from 27 cents to \$1.69 per hundred. In other words, the digestible nutrients of linseed meal cost seven times that of those of wheat straw. It shows that the digestible nutrients of corn at 28 cents per bushel cost less than half what those of bran at \$15 a ton, and costs less than those of clover hay at \$6 a ton. It shows that the digestible nutrients of timothy hay at \$9 a ton cost about one-half more than corn at \$10 a ton; it shows that when oats are 25 cents per bushel their digestible nutrients cost 99 cents per hundred weight, while with corn at 28 cents per bushel the cost of digestible nutrients is 62 cents per hundred weight.

If the digestible nutrients of wheat straw cost 27 cents per hundred weight and corn stover at 28 cents, while those of corn cost 62 cents, why not feed wheat straw and corn stover, instead of corn?

If we assume that a milch cow requires 16 pounds of digestible nutrients per day, she could obtain this amount by eating 43 pounds of wheat straw, by eating 45 pounds of corn stover, or by eating 19 pounds of corn. Nineteen pounds of corn, occupying one-third of a bushel, a cow could eat without any special effort, but to consume 43 pounds of wheat straw or 45 pounds of corn stover is quite beyond the power of the most ravenous cow, even though these foods contain nutrients in the right proportion, which they do not.

We have pretty generally learned, although we may fail to put our learning into practice, that the feeding ration should contain a certain proportion of digestible protein, or nitrogenous substances, to non-nitrogenous substances; in other words, a right nutritive ratio. But the mistake is frequently made in calculating feeding rations of not taking into account the amount of dry matter which is necessary for the animal to eat in order to get the required amount of digestible substances.

A prominent and able farmer in Ohio at one time advocated the substitution of clover hay for oats for work horses, on the ground that the analysis showed that clover hay was equal, if not superior, to oats. As this happily illustrated the point I am urging at this moment, I will show in a table the number of pounds of the several nutrients in clover hay and oats in a ton:

NUTRIENTS IN A TON.

	Oats.		Clover Hay.	
	<i>Fed.</i>	<i>Digested.</i>	<i>Fed.</i>	<i>Digested.</i>
Ash	68	. .	166	. .
Albuminoids	264	230	312	178
Fibre*	216	56	550	242
Starch, etc.*	1,340	1,032	860	598
Fat	112	87	112	63
		1,405		1,079

*Carbohydrates.

While it is true that the composition of hay and oats are somewhat alike, when we come to feed them to horses we find some marked differences in the amount of digestible nutrients that a ton contains.

In the oats, a horse would digest 1,405 pounds in a ton, while 1,070 pounds of clover hay would be digested. Assuming that a horse requires daily 15 pounds of digestible substance, he could get it by eating 21 pounds of oats or by eating 28 pounds of clover hay. The oats, thrown into the feeding box, would occupy two-thirds of a bushel, while, if the clover hay was packed as tightly as it is in the hay mow, it would more than fill five bushel baskets. Just think of the work consumed in getting outside of five bushels of clover hay! The difficulty of incorporating cheap fodders in the feeding ration is shown by the following table:

RATIONS FOR MILCH COWS.

	<i>Fresh.</i>	<i>Dry.</i>	<i>Digest.</i>	<i>Protein.</i>	<i>Cost.</i>
Corn fodder	12	7.0	4.6	0.31	3.0
Clover hay	8	6.8	3.5	0.53	2.4
Corn	8	7.1	6.0	0.63	2.9
Gluten meal	2	1.8	1.6	0.51	1.0
Total	30	22.7	15.7	1.98	9.3
Corn fodder	10	5.8	3.8	0.25	2.5
Clover hay	5	4.3	2.2	0.33	1.5
Wheat straw	10	9.0	3.8	0.08	1.0
Corn	8	7.1	6.0	0.63	2.9
Gluten meal	2	1.8	1.6	0.51	1.0
Total	35	28.0	16.4	1.79	8.9

Is roughage necessary? Are coarse fodders necessary to the growth and development or even the existence of ruminants? The fact that in the natural state ruminants lived on foods containing more crude fiber than our grains and by-products, and less crude fiber than our hays and straws, or other roughage, creates the presumption of moderate bulkiness, but it does not prove the advisability of such a system of feeding under present conditions.

Under civilization, man has changed his food habits, as well as other habits, for better or worse. Under domestication, animals require different treatment than in the state of nature. A horse requires shoes and is improved by currying.

The wild boar never tasted Indian corn. The wild boar originated on the Old Continent and Indian corn on the New.

It was not until America was inhabited by the Europeans that corn and hogs became indissolubly connected, and thereby made pork one of the great food products among civilized nations.

Several experiments have been made to determine whether ruminants, namely, cattle and sheep, could be successfully raised without the use of any coarse fodders.

I ask you to bear with me while I briefly review these experiments.

Davenport, of the Illinois station, made four attempts to grow cattle without coarse feed. These experiments began with calves immediately after birth. In one case, a calf was fed seven months on skim milk; at the age of four months, it consumed six gallons of skim milk daily. At the end of seven months, the calf could not hold its head up, and seemed nearly dead—refused to get up or take milk. Hay and straw was then placed before it, and it ate greedily of both. In three hours it was ruminating for the first time in its life. The calf continued to improve on the hay and milk diet, when, at the end of ten days, oats were added, and the calf subsequently recovered.

In the other experiments, the calves had, in addition to milk, a grain mixture, variously compounded. but, in all cases, from four to seven months, the calves began to show some of the signs of starvation, which the addition of coarse fodder to the diet at once rectified. In one case, death occurred before the addition of coarse fodder. The first sign of starvation is always accompanied by an enormous appetite and an enormous consumption of food. One calf at six months of age ate one-half bushel of grain daily, in the vain attempt to satisfy the cravings of its appetite. In no case was there any digestive disturbances, the bowels remaining normal throughout. It is a good illustration of the fact that the amount of food consumed is not a necessary measure of its economic use. Professor Davenport believes these experiments prove that eating the coarse food is a constitutional habit, acquired, doubtless, through the ages which their ancestors have been compelled to eat coarse food. A logic of this argument is that we must feed calves at least on roughage, not because it furnishes digestible crude fiber, which is identical to the function in digesting starch, but because their ancestors have been in the habit of eating bulky food and can not live without it. I do not wish, at this time, to deny this proposition, but I wish to point out that the food which he fed the calves may have been lacking in some of the essential ash constituents, such as lime, which is no part of crude fiber, but simply accompanies it. It may have been that the addition of the spoonful of phosphate of lime would save the necessity for the feeding of the coarse fodders.

Sanborn, at the Utah station, fed cattle and sheep of different ages for several months without any roughage. In one instance, a calf died from, it is reported, indigestion, caused by eating sawdust, which was used for bedding. In all the other cases, the cattle and sheep were fed successfully for long periods.

They made one pound of growth on about one-half what is required for the ration containing the usual amount of roughage. They practically ceased ruminating and drank but little water.

As far back as 1874, Mr. L. W. Miller, on wintering dry dairy cows on corn meal alone, attracted such attention that the New York Dairymen's Association sent a committee to investigate his system. It was found that he was wintering 900-pound cows exclusively on corn meal, which

received on an average but three quarts, and the amount of water drank was small, only about ten pounds. There were no signs of suffering or unrest in any way. The calves subsequently born to these cows were reported of more than ordinary size, fleshy, strong, active and healthy.

The ordinary ration for maintaining dry cows contains $17\frac{1}{2}$ pounds of dry matter, 9 pounds of which is digestible. But here we have $4\frac{1}{2}$ pounds of dry matter containing 4 1-10 pounds of digestible matter—less than one-half as much doing the same amount of work and doing it just as well. There is not time to dwell at length for the reason of this difference in the economy of foods fed. Among the reasons may be stated, briefly, the less work required to digest the food, the less effort required to carry the contents of the stomach, and probably less heat required in evaporating the water.

The true nutritive value of food is the difference between the amount of food digested and that portion which is required to sustain the digestive functions. This difference might be called the net nutritive value, to distinguish it from the total digestible nutrients.

Some experiments have recently been made in Germany with horses that illustrates this point. The following table shows the total digestible nutrients in 100 pounds of substance when fed to horses, and also the pounds of digestible nutrients which were expended in the labor of chewing and digesting the food:

	<i>Crude Fiber.</i>	<i>Total Digestible Nutrients.</i>	<i>Labor Chewing and Digesting.</i>	<i>True Nutritive Value.</i>
Medium hay	26	39	21	18
Red clover hay	30	41	24	17
Wheat straw	42	18	30	12
Oats	10	62	12	50
Corn	2	78	8	70
Linseed meal	9	69	13	56

It is obvious that the difference between these two quantities is the amount which is available for the other functions of the body, such as the production of labor in the horse, the production of flesh in a steer, and the production of milk in a cow.

These experiments need to be repeated before any great confidence can be placed in the results, but they are very suggestive of the possible relative values of our various feeding stuffs.

Some years ago, there was a shortage of hay throughout the country, and, in common with a good many other dairymen and farmers, we had exhausted, on the Ohio State University farm, all roughage of any kind a short time before grass arrived, and we were reduced to the necessity of buying hay, if roughage was to be had. We could purchase baled prairie hay at \$16 per ton, corn and cob meal at \$12 per ton, bran at \$13 per ton, and linseed oil meal at \$18.50 per ton. We were, at that time, milking thirty head of cows, which we divided into three lots of ten cows each, and, after feeding them nine days on the same ration, we placed each lot on the ration indicated in the following table, the plan being to

give each lot of cows the same digestible nutrients, while varying the amount of roughage:

	<i>I.</i>	<i>II.</i>	<i>III.</i>
Western hay, lbs		15	5
Corn and cob meal, lbs	18	6	12
Bran, lbs	2	3	3
Oil meal, lbs	3	3	3
Cost, cts	15	20	16
Dry food, lbs	19.8	23.4	19.8
Digestible food, lbs	16.2	15.7	15
Digestible protein, lbs	1.92	1.93	1.91
Gain or loss milk per cow for nine days, lbs	3.1	-13.2	5.9

It will be noticed that one lot received about the usual amount of roughage, and, while one lot received much less, the roughage consisting of only 5 pounds of hay per day, while one lot received only corn and cob meal, bran and linseed meal.

The first observation of importance in this connection that I wish to make is that none of the cows died under this treatment, neither did they indicate unusual symptoms of any kind.

In the second place, the cows which received 15 pounds of prairie hay per day lost 13.2 pounds per cow during the nine days of this trial, as compared with the previous nine days, while the lot which received no hay or roughage, of any kind, gained 3.1 pounds per cow for the nine days, as compared with the previous nine days.

It should be noted, however, that the cows which received a small amount of hay produced slightly better results than those which received no hay, although at a somewhat increase of cost on account of the greater expense of the hay.

What practical application have these experiments? I think they show that at the present prices we are in danger of feeding more roughage than is wise economy. Let us assume the ruling farm prices of a number of our stock foods to be: Timothy hay, \$9 per ton; corn stover, \$2; bran, \$15; linseed meal, \$25; corn, 28 cents a bushel, or \$10 per ton. Suppose, now, a man only has timothy hay of first quality to feed. Is it wise to feed hay at prices named? We present the following tables bearing upon this point:

	<i>Fresh.</i>	<i>Dry.</i>	<i>Digest.</i>	<i>Digest. Protein.</i>	<i>Cost.</i>
Timothy hay	10	8.68	4.94	0.28	4.5
Corn stover	10	5.95	3.57	0.17	1.0
Corn	5	4.47	4.21	0.39	2.5
Bran	2	1.76	1.12	0.26	1.5
Linseed meal	3	2.70	2.22	0.85	3.8
Total		23.56	16.06	1.95	13.3
Corn stover	10	5.94	3.57	0.17	1.0
Corn	11	9.83	9.26	0.86	5.5
Bran	2	1.76	1.12	0.26	1.5
Linseed meal	3	2.70	2.22	0.85	3.8
Total		20.24	16.17	2.14	11.8

In the first ration, we feed 10 pounds of timothy hay and 5 pounds of corn or corn meal, while in the other ration we omit the timothy hay and feed 11 pounds of corn, instead of 5 pounds, with the other elements in their ration remaining the same.

The first thought, perhaps, is that one can not afford to feed so much corn, but a glance at the cost of the ration shows that, by substituting 6 pounds of corn for 10 pounds of timothy hay, we reduce the cost of the ration over 10 per cent., at the same time increasing slightly the digestible nutrients and quite materially the digestible protein.

The first ration requires the cows to eat $23\frac{1}{2}$ pounds of dry matter to get 16 pounds of digestible nutrients, while in the second they need only to eat 20 pounds of dry matter to get the same digestible nutrients. This, I believe to be an important item.

There is no doubt in my mind that the cows will produce more milk on the second ration than they will on the first. I have no doubt that cattle could be fattened much more quickly on the second ration.

DISCUSSION.

President Billingsley: We have quite a different range of prices from those named. Timothy hay with us is worth about \$12 a ton; clover hay from \$9 to \$10, say an average of \$9.50. What would be the relative value of silage at those prices?

Professor Hunt: The silage figures out, counting \$2 a ton for silage, and assuming the silage is the quality that has been analyzed, somewhere about 45 to 50 cents. Corn whole silage, 45 to 50 cents per 100 pounds. You will notice that even at 45 cents a hundred that is \$9 a ton. Your digestible matter in timothy hay costs you 90 cents. Timothy hay would be a pretty expensive feed at those prices, as compared with corn, or even bran.

President Billingsley: The actual price of bran with us is \$15. What would you feed in place of it, so as to avoid buying it?

Professor Hunt: I am sorry I did not figure out and place before you the ration we actually feed. I know the sentiment in regard to most theoretical tables. You know about the man who said he was raising 50 tons of cabbage to the acre, and he wrote about it a great deal in the agricultural papers. Finally they sent a committee around to see how he was raising that immense amount of cabbage, and the committee came there and the man was not present, but the gardener was there, and he took the committee back, and they asked where the cabbage was. The gardener said, "Oh, back here." They went back and found four or five undeveloped cabbages and one big one. The gardener said: "This big one is what the Professor figured on. He said, 'If I had so many of those cabbages per acre, I could raise that many tons of cabbages.'"

During the month of November we fed our cows, some forty-two head, 27 pounds of ensilage, seven pounds of rather poor weedy hay that would not sell in Columbus, I suppose, at \$6 a ton. We are feeding 6½ pounds of shock corn—understand, corn, and all right in the shock. That is what they eat outdoors in the daytime. Just feed it that way. Then we are feeding them one pound of bran only a day. Two pounds of gluten meal, and 3 pounds of malt sprouts. We buy malt sprouts at \$10 a ton. This is cheap, and costs us 12 cents a day. Three pounds of malt sprouts, 2 of gluten meal, one pound of bran, 7 pounds of hay, rather poor, weedy hay, 6½ pounds of shock corn, and 27 pounds of ensilage, actual weight, and that was the average for the month of November. The man who has charge of it brought the figures in to me just accidentally a day or two ago. So I know exactly what we are doing.

Mr. Woods: Do you feed the malt sprouts dry or wet?

Professor Hunt: We wet the malt sprouts in water, and let them stand twelve hours. We put in gluten meal also, and then mix bran in and put it on top of our ensilage.

Professor Plumb: I want to raise the question Mr. Billingsley brought up, that of timothy hay and silage. Day before yesterday I received a letter from a gentleman in this State who notified me that the man who was in his employ was going to leave him right away, and he had to go to the farm and make an appraisement of the stock and supplies he had, and among other things they had a silo with a lot of silage in it, and he wanted to know what value he ought to put on that silage in the silo. I would like your opinion.

Professor Hunt: I told you it would cost us about 12 cents. I have told you the value of 27 pounds of ensilage at \$2.60 a ton; that would be 13 cents a hundred.

President Billingsley: How does that compare with the cost of other feeds, relatively?

Professor Hunt: At that price the digestible nutrients in the ensilage would cost you about 50 cents a hundred, and timothy hay at \$9, the digestible nutrients are 90 cents a hundred.

Professor Plumb: I think the price Mr. Billingsley puts on timothy hay for the Indianapolis market is altogether higher than the average for the State.

Professor Hunt: I put it at \$9 a ton.

Professor Plumb: Your \$9 a ton is more representative of Indiana prices. In Tippecanoe County I think that \$8 a ton would be a fair valuation for timothy hay, year in and year out. In feeding experiments con-

ducted with timothy hay and silage, I think Professor Hunt will bear me out when I say it is generally considered that one ton of timothy hay is equivalent to about three tons of silage. I wrote to his gentleman that I should figure on his silage having a value of about \$2.50 a ton.

Mr. Willson: That silage is where the timothy hay is?

Professor Plumb: Exactly. But here is the point I make. The silage has no commercial sale in the market. Your timothy hay has. But for feeding value they are both to be used. Putting a valuation on an article not for sale in the market at \$2.50 would be a fair price, for the reason it represents about one-third the value that you assign to timothy hay.

President Billingsley: If the value of timothy hay is \$12 a ton, then the value of silage for feeding purposes would be \$4, and that was exactly the price put on it at the Columbian Exposition in the great trials made then.

Professor Hunt: Why not compare it with corn meal at \$10 a ton, instead of timothy hay at \$12? You don't need to feed timothy hay; you can feed corn meal.

President Billingsley: How did the Columbian Exposition come to put a value of \$4 on silage?

Professor Plumb: I can't account for what they did at the Columbian Exposition but you can easily see there are materials in the market that in reality have high feeding value. Malt sprouts, for instance, have a high feeding value when fixed right, and they are really very cheap.

Mr. Knox: I would ask the professor if he would sell timothy hay and buy clover—substitute clover for the timothy?

Professor Hunt: At what price?

Mr. Knox: At \$8 for the timothy and \$5 for the clover.

Professor Hunt: Unquestionably, if you can exchange them without labor; if they can be exchanged on that basis by all means effect the exchange. If, on the other hand, you have to haul the timothy hay to market and haul the clover hay home, you may work out your \$3.

Mr. Knox: The question I want to determine is, Is timothy worth as much per ton to feed cattle as clover?

Professor Hunt: I think not, quite.

Mr. Knox: What is the difference, about?

Professor Hunt: I can't give you any definite statement as to that, and no definite statement can be given, because it is a question of com-

bination with other feeds. Definite statement can be made to your first question, and that is, clover hay can be fed at \$5 a ton even now, at the price of feed, and timothy hay can not, economically, at the price of feed.

Professor Plumb: A large amount of timothy is cut in our State that is almost equal to straw. They do not cut it until it gets yellow, and that kind of timothy dairy cattle can not eat satisfactorily. To get the best returns it must be cut before it reaches that state.

Mr. Drennen, of Philadelphia: From my experience as a farmer. I find timothy hay, as Professor Plumb says, may be worth \$10 a ton or may not be worth \$3 a ton. You can cut your timothy hay and cure it in such a way that it is almost useless, whereas if it is cut at the right time, and cured at the right time, it is one of the most valuable feeds we have. Not only cattle fatten on it, but horses. So it seems to me, in estimating the value of a ton of hay, that is of very great importance. We should know the right time to cut timothy hay and the proper way of curing it. This certainly is a matter of very great importance. I will undertake to winter a horse without any grain at all if I can get my timothy cut at the right time, and have it cured as I wish.

Mr. Nugen: What is the right time to cut timothy?

Mr. Drennen: I have not been on the farm since I was about fifteen years old, but I learned even at that early age something about curing hay. The right time to cut timothy hay is about the time you notice the root of the stalk beginning to turn a little yellow or white, indicating that all the substance that it ever would receive had passed up above the ground or into the stalk, and then securing it before the seed had entirely ripened. If you watch a stalk of timothy as it is growing, you will find it commences to die at the bottom, and that the substance is gradually passing up through it, into the kernel, and ripens it. After that the stalk is comparatively useless. The substance is all in the seed, and in order to get anything good out of timothy hay you must get it right at that point, and cure it properly, and you can keep your stock fat with it even if you do not give them any corn.

Mr. Roberts: I would like to ask the professor if he limits the price of fodder to ten cents a hundred?

Professor Hunt: Yes; \$2 per ton.

Mr. Roberts: Does that mean fodder left out in all the weather, or fodder hauled in when nice and ripe, without any rains or snows on it, and cut with a machine and put into the mow?

Professor Hunt: You can not do that, I think, at \$2 a ton. My ordinary practice is to husk out the corn and shock it in good big shocks.

and under these conditions the labor costs you somewhere about \$2 a ton. I did not want to figure an unreasonable cost, but I wanted to fix the corn stover at the price it would cost the average farmer. Handled the way you say, it would have to be figured at a higher price.

Mr. Roberts: You may put your fodder in the barn and put it in good shape, and you will find it the cheapest feed you can put up. If you build sheds and haul your fodder in out of the weather it will be the best feed you can get—far better than timothy hay, next to clover hay.

Mr. Adams: I would like to ask the professor if I am to understand that timothy hay is cheaper for the farmer to raise and feed to his cattle and horses than clover. Suppose I mow my meadow and I get two tons to the acre of each, timothy and clover, that I put it into the barn in good shape, the clover when the heads are about two-thirds brown, and the timothy when the bloom has principally fallen off, without going to the root to examine it—I was born and raised on a farm, and I am there most of the time yet, when not visiting institutes and such places as that, and I am somewhat surprised, and I want to know if I am to understand that the timothy hay is preferable for us to raise and feed to our stock instead of clover hay?

Mr. Woods: I want to say that we used to feed timothy to the horses nice timothy, too. But I plowed up our timothy and fed the horses corn stalks, and I will say positively that for the last three or four years our horses have done better on corn stalks than they used to on timothy. They look better and healthier. Therefore I think that for feeding horses corn stalks are more valuable than timothy. In regard to timothy and clover hay for dairy cattle: I have a barn with sheds on each end, and in one end I have timothy and the other clover. I had been feeding the cows the same grain ration, and they were giving the same milk. I went to feeding hay, and I fed clover to one lot and timothy to another lot, and the cows that were eating the clover gained considerably over the ones eating the timothy hay. In regard to ensilage being heated and sticking, does that require as much energy to convert it into usefulness as it does dry fodder?

Professor Hunt: An experimenter never likes to guess about one thing because he happens to know something about another. I will say, however, there have been experiments made on the digestibility of ensilage and the digestibility of shock corn—you understand what I mean—one is dry and the other is moist, and assuming they are fed under the same conditions, no special difference is found in the digestibility of the two. They are just about equal. The animals seem to like the ensilage the better, and eat it up cleaner, and eat more of it every day, and consequently we use ensilage for that reason, not because we think there is a pound more of food value in one hundred pounds of dry matter in ensilage

or shock corn, but because the animals like it better, and eat more of it. The point I make is this: If you have raised twenty-five tons of timothy and twenty-five of clover, and clover hay is worth \$6 a ton, and timothy is worth \$9 a ton, and corn \$10 a ton, it is wise economy, in my judgment, to sell your timothy hay, and feed your clover hay, and then if you have not feed enough to feed your cattle, buy some corn meal with the money you get for your timothy hay. That is the proposition I want to get before you. I have not discussed the relative values of these foods per pound at all. In addition to that I wanted to get before you the fact that if it was cheaper to feed concentrated feed you need not be afraid of doing it.

THE ADVANTAGE OF THE CREAMERY AND CHEESE FACTORY TO THE COMMUNITY.

DAVID SHELLENBERGER, DUBLIN, INDIANA.

In undertaking to prepare a paper on this subject, we find that the advantages of the cheese factory and creamery to the community are many and of far-reaching importance. We find that from a financial standpoint, we must admit that they are a decided success.

The farmer who tried to produce a good flow of milk from his herd of well-fed cows, and converted the same into butter, and put his product on the home market, invariably found he was losing money; but since 1891, when the cheese factory and creameries were started in Cambridge City, Centerville, Lewisville and Hagerstown, the farmer has been looking into the matter of selling milk to see if the results from the same would be better than selling butter on the local markets at whatever price the merchants felt like giving for dairy butter.

The question went out, "Will it pay to sell milk?" As this was a new industry, many farmers were slow to undertake it, while others started at once. Some soon became dissatisfied and condemned the industry, as you are aware, in the defunct creameries in this State from 1892 to 1894, and said it was not a paying business. Others continued selling milk and increased the number of cows and are selling milk to-day.

Many farmers have long since found that the factory is a much better method of selling the product from the cow than was expected and that the creamery and cheese factory are a decided success for the milk producers. We see that the industry is growing at a rapid pace, though yet in its infancy.

What we as farmers and milk producers want to do to still make these industries of more advantage to the community, is to improve and in-

crease our dairy herd, and in doing this, we must not forget to look after the cow that will produce the best results when we are asked to sell our milk under the Babcock test, so that we may have at least a standard milk.

We find that many farmers (and possibly some in this audience) are slow to take hold of the question of selling milk for the reason of the test. If they are asked the reason why they still continue to make butter at country prices, they will answer you by saying the testers are a cheat and an unfair way of selling milk. Possibly these same parties have never studied the fact that the amount or loss of butter fat will vary from two-tenths to eight-tenths in two days from an individual cow. It has been my experience that cows will vary from five and two-tenths to four and six-tenths, with same feed and care.

If these parties who condemn the buying of milk by the test would experiment and educate themselves to the difference in the quality and the quantity of milk of one cow in the course of ten days, they, no doubt, would change their opinion in regard to the value of the test. It is an eminent fact that it will pay all who sell milk to investigate these things before making a kick, and then they will be ready to voice the sentiment that it pays to sell milk. We have had parties selling to our creamery drop out and sell at another place, saying they were not satisfied with the test, and state that they would sell at another place. But in the face of this they confess that it pays to produce milk as a product of the farm.

It has been our experience that if we want a good paying investment on a monthly income from our cows, we must do a great deal ourselves, as no cow can produce a good flow and quality of milk unless there is the proper feed, care and attention bestowed on her. We take the affirmative side of the question and candidly say that it pays to sell milk, whether we can have the returns from the creameries for the pigs, etc., or not.

The monthly financial returns may seem small, but if we keep faithfully at it, the good results will come by and by. We can all say with one voice, give us more milk, and that the creameries and cheese factories are advantageous to the community.

DISCUSSION.

Mr. Kingsbury: The gentleman says the business pays. We would like to know how much it pays to the average cow, with the care and attention he says is necessary.

Mr. Shellenberger: In my experience it pays far better to sell milk at factory prices than to make butter and sell it in the home market at the prices ruling to-day. Our cheese factory here will pay us a little better than eighteen cents a pound on the average for 1899 for butter fat in the

milk, which is considerably in advance of the prices we are getting here at home for butter.

Mr. Van Norman: What did they pay last month?

Mr. Shellenberger: I understand from Mr. Drischel that he was going to pay twenty-three cents for butter fat in November.

Mr. Woods: How many pounds will your cows average a year?

Mr. Shellenberger: I have not kept any record only in 1897. In 1897 we sold from three cows 17,000 pounds of milk, lacking a few pounds.

President Billingsley: What do you get for country butter?

Mr. Shellenberger: Fifteen cents a pound here. Mr. Drischel says he paid here twenty-three cents for butter fat in November.

Mr. Willson: What do storekeepers out here pay for dairy butter at the present time?

A Member: Twenty cents. They pay me twenty-two, or they don't get any.

Mr. Drischel: Following the local markets here for the last three or four years, the price is not over twelve cents for dairy butter. It sometimes runs down to seven or eight.

President Billingsley: I was in the commission business once for some time, and I handled a good deal of butter that was not worth any more than that.

Mr. Adams: Right there is the secret of the matter. I don't like to hear the words dairy butter connected with what should be called country butter. There is a difference. You take the private farmer, running a private dairy; he has a separator; he has an improved churn; he has a butter worker, and all the improvements that you have in the best equipped creameries. I had quite a little discussion in the creamery not long ago with the butter maker in the creamery. That was three years ago. At that time I was selling butter at twenty-five cents a pound six months in the year, and at thirty cents six months in the year. I happened to pass the creamery and called in, and talked to the butter maker, and he saw I was interested, and he wanted to know if I was running a creamery. I said to him that I was not, but that I was running a small butter dairy on the farm in connection with farming. He wanted to know what I got for my butter. I told him. I saw at once from the man's countenance he did not believe it. After talking a little while he said, "Look here, did I understand you to say you were getting thirty cents a pound for your butter for six months of the year?" I said to him, "Yes, sir, that is what I said." He said, "We can't get that price for our butter.

and you must remember our butter scores high, and we got a nice premium at the World's Fair." I said, "That is easily accounted for." He said, "How do you account for that?" I said, "We didn't have any butter there." He did not know what kind of reply to make to that. Then he says, "I can't understand how you get thirty cents a pound for your butter." I said, "It is rather hard to understand." He got a little angry. I said, "I did not call in for any fuss; we are not going to quarrel at all. We will talk this over in good humor." I asked him if it was not possible for me to be just as good a butter maker as he was, and he did not want to answer the question, and I pressed it. Well, he finally admitted it was possible. "Now," I says, "we will suppose I am just as good a butter maker as you are, and I have a private herd of Jersey cows, and we do our own milking and feeding, and handling of the product, from start to finish, and deliver it ourselves to the customer. Now, don't I have just a little bit better show to make a gilt-edge article of butter than you have, taking in everybody's milk, and having it hauled, and all that?" Well, he admitted that probably we did. He wanted to know where I was selling my butter. I said, "In the city of Richmond." He said, "We send hundreds of pounds there, and only get a quarter for it." I said, "That don't make any difference. I am getting thirty cents." There is just where the trouble is. There are so many farms where the butter is made by the woman of the house, and nine-tenths of these women make butter the way their grandmothers did. If I want to get into a fuss when I get home right quick, all I have to do is to find a little fault with mother's butter; and then I get into it in a hurry. She says, "Grandmother taught me to make butter, and she could make as good butter as anybody." You might just as well find fault with a woman's baby as with her butter. You will get into a racket about as quick. There is the trouble, and that is the reason why so much miserable stuff gets on the butter market, called country butter. It is because our women, as a rule, do not read any dairy literature, and if they did they would not believe the suggestions made there, and try them, and if they would do that and invest a dollar in a good weekly dairy paper, and read it, and act somewhat on the good advice they have from thousands of contributors during the year, the butter of this country would bring a better price.

Mr. Van Norman: I would like to take exception to part of the gentleman's remarks. He says the reason why so much of the butter made in farm homes is poor is because they follow the same methods their grandmothers did. I think in a measure that may be true, but, on the other hand, the largest proportion of this poor country butter—anybody who knows the butter will admit it is often poor—is poor because they make so little of it, comparatively speaking, and they can not afford, or do not care, to take the time or give it the thought required to make it

right. A person making only three or four pounds of butter a week is not always careful to see that the kitchen or dairy room is free from the odors that are common to that room. I heard a man, speaking in public, make this statement—I do not give it for truth; I simply quote it, because under it all there is an element of truth which most of you will recognize. He said he was called on to judge a lot of butter. He ran the trier in and brought it out and passed it under his nose, and he could give the family history for a week. In the first place, there was marked off each day's churning, it being of a different color, and each day's churning had an odor peculiar to itself. On Monday they do the washing, and there is a smell of soapsuds. On Tuesday Johnny fell out of a tree and sprained his arm, for there is a smell of arnica. The next day they had a boiled dinner, and so on. In making butter in the home, often there is such a small quantity made that they do not take the pains with it that should be taken. It is not always because they do not know how.

Mr. Willson: Mr. Adams says the women are to blame for so much poor butter. I do not believe it. If the men would furnish the apparatus the women would do it right. The men will get a riding-plow, so they can do things easily. They will get a reaping machine, and a mowing machine, but the poor woman has to do everything she does about the house in connection with the dairy by hard labor, and I stand up for the women, the women who do the work of the house, and who are asked to milk the cows and make the butter. I say that is not fair, and I say so every time I get a chance in a dairy convention. (Applause.)

Professor Plumb: I want to call attention to something that happened in a county where I was acting as judge of an exhibit of farm dairy products. There was a showcase, and it was filled with a very attractive looking lot of farm butter, yellow, attractive, nice-looking butter. I had a class of dairy students come in and examine it. The average man or woman, looking at the showcase, would say, "What beautiful butter." After I tasted and smelled this butter, I changed my mind completely about it. As Mr. Van Norman has said, I could taste dishcloths, onions, and quite a variety of things. The butter was colored well and looked attractive; but nothing affects values so much as quality, and quality in butter is shown more by the taste and flavor than by the looks. There wasn't a woman that had shown butter in that exhibit but what would have felt highly indignant if I had told her that her butter was not good. In that showcase there was only one lot of butter that I would class as nice butter, with a fine aroma and flavor, such as would command a good price in the market, and a large majority of that butter practically disqualified itself for selling in a market where creamery butter readily sold, because of its poor flavor. Turning from that subject, there is one important point which has not been discussed, and that is the increased fertility of your land. Going further east, to New York and New England, you

will find that dairies have become a permanent feature on those farms which have deteriorated and run down, and there is nothing brings back the fertility of those New England and New York State farms as quickly as to have the owners follow dairying. They have large dairy herds on their farms, and, carrying back on to the soil the material that was originally grown on the farm, and then putting on the soil also a large amount of material that is ordinarily bought by the dairy farmer, I guarantee that the more your herds of dairy cattle increase the richer will be your land, and the greater benefits will accrue. A friend of mine made a special trip to Elgin. He said he found the farmers there complaining of the hard work in connection with dairying, but he said, "I found them prosperous, and they admitted they made money, and it greatly benefited their lands, that it was a very remunerative occupation. The only thing they grumbled at was that it calls for work if you get the best success out of it."

The convention adjourned at 4 o'clock p. m., Thursday, December 7, 1899.

EVENING SESSION.

7:30 p. m., December 7, 1899.

Mr. D. W. Willson, editor of a dairy paper published at Elgin, Illinois, being present, was invited to address the meeting and responded as follows:

Mr. Willson: Your President here has taken me a little bit by surprise, but we ought never to be surprised when we want to talk about good things, and, coming from Elgin, as I do, it occurred to me when he spoke to me this afternoon that some of you might wish to know how it was that Elgin is so great and important a factor in the dairy industry. You people in Indiana, visiting your stores in the larger cities, and in some of the smaller towns, find placards in the grocery stores, saying, "Elgin creamery butter for sale here." Sometimes this butter is sold at twenty cents a pound, when we are getting twenty-two to twenty-five cents a pound at the groceries in our city of Elgin for creamery butter. The truth is this butter advertised at twenty cents as Elgin creamery butter is not that butter at all. It has a standard fixed price that is established by our Board of Trade every Monday, and it can not be bought at a grocery at any less price than the price established by our Board each Monday afternoon. Why was the Elgin Board of Trade established? What has it done for the dairymen of this State, as well as Illinois, and why is it now a recognized authority on butter? The reason these things are so prob-

consin. We call that the Elgin district because all the butter made in that territory is made practically along the same lines in creameries, by the centrifugal system. Now, then, one or two years back; I will not go back of 1893; it would take too long. But we will take the years 1897-98. For 1897 the members of our Board sold 44,224,020 pounds of butter, for which they received \$9,137,219. They sold of cheese 9,530,668 pounds, for which they received \$618,843, a total for cheese and butter made by the members of our Board, \$9,750,663. That was for 1897, the lowest priced year on an average we have ever had since the Board was organized. Now, then, for 1898. We made only 42,579,139 pounds of butter, which brought us \$8,004,878.13. We made 6,841,715 pounds of cheese and sold it for \$496,024.33—a total of \$8,500,902.46. Now, then, figures, when we come to look at them, we are going up into millions; we hear of millions and talk of them and read them, but we do not fully understand what that means. Suppose that money were divided among the farmers at \$1,000 each—the butter values and cheese values for last year. You see it would make a great many farmers very happy to have \$1,000 each year as an income from the dairy. There would be nearly 9,000 farmers who would have received \$1,000 a year for dairy products, just from the amount of butter and cheese sold by the members of our Board of Trade—about 150 people. Now, mind you, the members of our Board of Trade do not handle, by any means, the amount of milk that is made in that district. Chicago receives every day from the Elgin district about 20,000 cans of eight gallons each. That is a great deal of milk, 160,000 gallons a day. We have two condensing factories at Elgin, one factory at Algonquin, one at Carpentersville, and one at Belvidere, five factories altogether, in which is received daily on an average about 500,000 pounds of milk. That means the product of a good many cows, and the value of that runs up into the millions again, the same as our butter does. Then there are a large number of private factories in our neighborhood, in the Elgin district, that do not report the amount of butter they make to the Elgin Board. They are not members of the Elgin Board, and do not report the amount. So we may safely calculate that the value of the dairy products in the Elgin district for the year 1898 amounted to between twelve and fifteen million dollars. That is a large amount, a wonderful amount of money to be paid for dairy products in a district comprising so small a territory as that around Elgin, or what we call the Elgin district.

Now, then, the object of this dairy convention, as I take it, is to encourage these people who are somewhat as beginners in the dairy business, to do better, to show them what opportunities are before them, to help to encourage them to make more and better milk, and thus make more out of their farms, and become better farmers and better citizens, and that is what the dairy business will do above all things else. A man can not be a thorough dairyman unless he studies the problems confronting him as a dairyman, and when he studies those complex problems

which Professor Hunt has been explaining, with reference to feeding a ration that will produce milk at the cheapest possible cost, keeping such cows as you may consider best for your purpose; the cow is nothing but a machine turning your roughage or farm products into the valuable product called milk. If you want to get the most out of that cow and out of those products, use the right kind of machine—I will not undertake to tell you which is the right kind, because the kind that might suit Illinois might not suit Indiana. The fact that dairying makes better farms and homes can be established, not only in your own State, but in every State where it prevails. You should be interested in this subject and take hold and learn something about it. Learn all you can. Do not forget that the man who sits at the editor's desk, like I do, can sometimes give you a thought that will help you out along your line of work. It is not alone the man who holds the plow and wields the hoe who accomplishes things in the world. It is the man who directs that generally does the work of this country—that is, the effective work. You can find any amount of people who can hold the plow, and drive a team, and make a furrow, but when he gets through with that furrow, has he done much for the world? The man who gives you a thought that sets 100,000 people to thinking in the right direction, he has done more for the world than a thousand men holding the plow, although the holding of the plow is as necessary as the other. In the dairy business it is not the man who holds the plow that accomplishes the most. It is the man who thinks out the problems that are presented on the platform here to-day, or will be during the course of this meeting, and will be presented every day in the agricultural papers, that you all ought to read—one or more. You may say this is book knowledge that these papers give you. It is not book knowledge, my friends. It is the experience of men who have, like your President, who have, like Professor Hunt, worked out these problems by hard labor, and who have thought and studied so that you might benefit by their experience. The facts are what you want, even though they may be given to you by the editor of a dairy paper who does not know a cow from a horse. The facts are what you must rely on to make better your condition, if you want to be a good dairyman. I will just say one word more. Indiana is so splendidly situated as regards her possibilities for successful dairying, that I say every man who lives here and makes this his home should stand up and do all he can to make Indiana dairying a success. You have around you the very best markets possible, and at very close range. You do not have to send your butter, as the Kansas people and the Nebraska people do, a thousand or two thousand miles to a market. You have St. Louis, you have Chicago, you have Cincinnati, and Louisville, and Baltimore, and Philadelphia, and all kinds of markets about you, with cheap and quick transportation for your finished product. And then, for your home product, look at the population that is coming into Indiana, and the growth of your manufacturing industries. It is the

grandest opportunity that could be presented to the people of any State, the opportunity that you have here for the development of dairying. Will you rise to the occasion and become good dairymen? That is the question the Indiana Dairy Association has to answer to-night. The badge of the Indiana State Dairy Association ought to be on the lapel of the coat of every man, woman and child here. They ought to be members and get the information that has been so freely given here, how to help them in their business. You can help to spread this dairy knowledge by becoming members, so that not only you will learn what has been done here, but so will your neighbors. (Applause.)

PRESIDENT'S ADDRESS — BUSINESS SIDE OF DAIRYING.

J. J. W. BILLINGSLEY, INDIANAPOLIS.

Three years ago, Prof. C. S. Plumb, who was then the President of this Association, gave us a very careful review of the dairy interests of the State. At the last annual meeting, the President, S. B. Woods, spoke briefly of his experience in pioneer dairying.

We need, as dairymen, to know more about our cows and their possibilities—which includes their adaptability to dairy work and the feed required to develop the largest and best product; the care and conditions that contribute to success in the business.

The program of this meeting, however, provides for papers that will, in most part, treat upon the subjects which I have named. As it is not my purpose to make an extended talk upon the dairy interests, I shall endeavor to speak briefly upon the practical business side of dairying from a business standpoint. A practical dairyman, whether he be a farm or city dairyman, should seek to know the truth in the business. A seeming familiarity with any branch of farming often leads to the neglect of it. That is, we have had to do with it so long that we are liable to drop into grooves and do things because in our practice in the past we have done the same way, and our way of doing them has become so familiar to us that we do not think it necessary to bestow any thought upon the method, or even inquire in our own minds as to the best method, or even better methods.

It may seem, to us who have grown up on the farm, that feeding a cow and milking her is indeed a very simple operation, so simple that all requirements to success in the undertaking have been fully met when we have fed the cow what we think is a full feed, and then milk her out clean. Indeed, some of us are disposed to resent any suggestions that

may be made as to better methods of feed and care and the better business methods. There are some city and farm dairymen who may be likened to the old-fashioned tallow candle that has burned low without any attention; they have terrific snuffs and give a poor light in the business. I would like to snuff some of these candles to-night.

We talk a great deal about scrub cows, and they need to be talked about until we are led to grow and fully develop the best type of dairy animals, but we need to talk quite as much about scrub dairymen and scrub methods. The best dairy herd in this county would in two or three generations degenerate into a scrub herd, with few exceptions, if fed on scrub feed and cared for by a scrub dairyman.

A few dairymen are successful because they give attention to the business—keep good cows and care for them and the product. Then there are experts in this, the same as in other lines of business, who put into it their best thought and effort, and who make fortunes.

A late bulletin issued by the Statistical Bureau of our State estimated the number of milch cows in the State to be 492,680, and the milk product at 144,533,666 gallons, being an average of 293 gallons per cow, or 2,500 pounds of milk. If we estimate the milk at 10 cents per gallon, the value of the average cow's milk product is \$29.30, to which add five dollars for the calf, and we have \$34.30 as the gross proceeds from the average Indiana milch cow. If I should ask the dairy farmers and dairymen present in this audience what per cent. of the 492,680 milch cows in this State are unprofitable, or, to put it in other words, how many out of this number do not pay for their feed and care, what per cent. (if you were called upon to speak out), in your judgment, would be your answer? Think a little and fix in mind the figures that would be your answer. Until I was over forty years of age, I was engaged in general farming, and owned from five to ten or twelve milch cows from year to year. They were kept principally to raise calves. The milk and butter, as I looked at it then, being side products, for family use, as far as they could be consumed, and whatever was left over, of milk, was fed to the chickens and pigs, and of butter was sold to consumers. My wife took charge of the butter making, and, being an expert in this line, we usually realized 25 cents per pound. She took quite an interest in it, so that the merits of good butter cows were soon ascertained, and if we had one or more exceptionally good butter cows they were spoken of frequently and highly prized. During the twenty years, there were probably a hundred or more cows that passed through my hands. Out of that number I can single out, in memory, but a small per cent. of excellent cows. And I venture the prediction that, if some of you farmers will call to mind the many cows you have owned, you will be surprised to find that you can not name or even remember but a few excellent butter ones. I mean cows that gave a large flow of good milk for seven or eight months, then falling off gradually in the milk yield until they neared the time of being fresh again,

or continued a considerable milk flow until they did calve. There are some cows that it is practically impossible to dry up by any ordinary means.

If you have fixed in your mind the probable number of unprofitable milch cows that are reported in the 492,680 milch cows in this State, estimating the cost of feed at from \$35 to \$45 per head, adding \$10 per cow for care and labor of milking and caring for the milk, let me refer briefly to a "cow census" taken in Jefferson County, New York. Jefferson County is a dairying district. It is to be supposed that the dairymen who have been in the business for two or three generations have compassed to some extent the possibilities of it. The following are some of the figures of this "cow census," as reported in Hoard's Dairyman:

Number of dairymen.....	367
Number of cows kept.....	5,507
Average number of cows per dairy.....	15
Lowest average gross earnings, herd of 10, per cow..	\$18 10
Highest average gross earnings, herd of 5, per cow..	81 00
Average gross earnings per cow as a whole.....	31 74
Average estimate of cost of keep per cow.....	36 36
Average loss per cow.....	4 66
Total loss on 5,507 cows.....	24,480 00

Of the whole number of cows reported, 70 per cent. failed to pay the cost of their keep. Of the remaining 30 per cent., 20 per cent. did not bring in enough over the cost of their keep to pay their owners for the time spent in caring for them. This would leave 10 per cent. of the 5,507 cows that were paying a net profit to their owners, or ten profitable cows in every hundred. May we not reasonably conclude from the above census that 10 men out of 100 were making a profit in dairying, 20 holding their own, and 70 losing money? Is it to be supposed that the 70 per cent. of unprofitable cows represent 70 per cent. of scrub dairymen in the 367 engaged in dairying? The census referred to was taken some twelve years ago. It is probable that the light of many such tests, the work of experiment stations, farmers' institutes, dairy papers and the discussions had in dairy associations, thrown upon the business in the past ten years, has served to quicken the thought and improve the methods of dairying. Returning again to the number of milch cows reported in this State, what per cent. do you think are paying a satisfactory profit? We do not mean to be personal in our reference to scrub dairymen, and it is not to be supposed that any of them are present in this intelligent audience. They seldom attend dairy conventions or read dairy papers. They are ever ready to say, "What do them fellers who publish papers know about dairying, anyway?"

However, some one in this audience may be ready to say, "My cows do not cost me \$35 or \$40 a year to keep them. I grow my own feed.

and I and my family care for the cows and do the milking." Very well, let us look at your view of the business. The hay or stover that you feed to your cows is worth to you, at least, what you can get for it on the market in dollars and cents, is it not? The same is true of any other feed that you produce. The labor that you and your family expend upon the business is worth in money what you would have to pay for it, if you had to hire it, is it not? Besides the items of feed and labor, you should allow a reasonable percentage for the money invested in the business. Then there is a risk percentage, or insurance, to be added to the expense account; cows die occasionally, and cows, like machinery, wear out, and have to go to the butcher and are usually sold at a loss, compared with their cost when purchased, or cost when reared on the farm; the cost of keep when the cow is dry; the wear and tear of implements, vessels, etc. All of these items should be charged up in right proportion to each cow.

The work of keeping an accurate account with the dairy and especially with each individual cow, may be objected to; "can't take the time." It is nevertheless true that a careful account of your business, including receipts and expenditures in full, is to you what a log book is to the mariner at sea. It will keep you off of the rocks and enable you to enter the harbor of success; without it the result is uncertain. It is so easy to run in debt a little here and there, to drag along without knowing how you stand financially, especially in dairying. I would urge upon all, young men especially, to keep accurate accounts of your business. We are living in an age of sharp competition, and the margin of profit may be so narrow that a few items not taken into account may result in the ruin of men of noble purposes. In dairying, give it thought, the best of care; provide liberally for the comfort and quiet of each animal; know each cow individually; keep an account with her and let the rule be ironclad that she must pay or go; follow this rule up closely, fill the places of those that have to go with a better type of dairying animals, and, my word for it, if the dairyman is intelligent, energetic and persistent, other conditions being favorable he "will get on in the world." If the dairymen of the State will follow up the weeding out of unprofitable cows, it will not be many years until the average milk product per cow will be double 293 gallons per annum. We may have fewer cows, but they will pay a more satisfactory profit.

I will give you what I regard a good rule to be governed by in the selection and purchase of a cow. Buy only those that will, in your judgment, pay a good profit and minister to your pride—a cow that you will be pleased to show to your friends. Let your purchases be object lessons of your intelligence in the business, known and read by all that may come and go from your dairy.

The same rule should govern in the growing of a dairy. Purse and pride are two important factors to insure success. Aim to grow no animal up to motherhood in the dairy that you can not take a pride in looking at,

caring for, as being in your judgment a promising dairy type. Put at the head of such a herd the best sire obtainable and stay by your business until you have a herd of cows that will make an average of 400 pounds or more butter a year per cow. It has been done, and more. What has been done in this line can be done again. Indeed, this record has been broken by much higher standards of excellence. To use an oft-repeated adage, "there is plenty of room on the upper shelf of this business," and magnificent possibilities.

Dairymen ought to lay hold upon every opportunity and means to increase their knowledge of the business. Read dairy literature, books and papers; get the experience of others in every way you can. It will save you many hard knocks in the business; attend dairy meetings, farmers' institutes; rub up against others, it will knock some of the moss off of even a scrub dairyman. If something new comes along that you are in doubt about, and want to know about it, write to the Experiment Station at Lafayette. They will gladly help you if they can. They are supposed to keep in touch with the dairy world, and do, no doubt. I have found them ready to help me, and we ought to use them more than we do. The whole Experiment Station staff are royal good fellows, and quite as ready to help you as they are to help me.

Lastly, some men's habits are against them in the dairy business. Milk and butter are very sensitive to any bad odors that may be abroad in the air, and are very likely to taste of them when they are brought to the table. Some dairymen are slovenly, thoughtless, uncleanly, idle, wasteful, and so on. Cleanliness is next to godliness in the dairy. If any of these things are against you, let me advise you to put on a new, white, clean suit of habits, then you can walk erect and feel a just pride in an occupation that calls you up to higher ground if you would have a crowning success.

As a parting word of advice, let me add that when you put on this new suit, do not fail to attend the meetings of the State Dairy Association; they will do you good.

WHY HAVE A SPECIAL TRAINING FOR THE DAIRY ?

G. P. NEWSOM, VALLEY MILLS

In discussing our subject it will be well to clearly define what training and what special training is, and to apply these to the dairy business.

Training indicates preparation by a line of studying and exercise to better fit a person for several and different occupations alike. Education

In the public schools tends toward making a man better fitted for any he may be a lawyer, a doctor, a farmer, or a dairyman, for who begins such a course knowing what position he is to occupy or fit himself for? We continue this course into the high school. The work here, too, is laid down. I wish to be a dairyman, my desk-mate expects to be a doctor, my neighbor a teacher, and so on. We take the same work. Does that constitute training? Most certainly it does. I will be a better dairyman, my desk-mate a better doctor, and my neighbor a better teacher for having taken this training. Such training is general.

Now concerning special training. This consists in following a line of study and practice which has for its object the fitting of a man for a given occupation, neglecting those things which do not lead toward that end.

To become an athlete I take that kind of exercise which will strengthen and toughen my muscles, and eat that kind of food which will make muscle and not fat and that which will keep my system in proper tone.

To become a doctor I must study anatomy, physiology, hygiene, medicines, their effect upon the healthy and diseased body, etc. To become a lawyer I must study those things which make a man fitted for the profession of law.

Now, I wish to be a dairyman. Is it worth while to take a course or line of training to that end? The dairy business is a complicated one. It may include all agriculture proper, such as the raising and storing of crops, care and preservation of soil fertility, reducing cost of production by increased production, etc., and in its own department includes care, feeding and breeding of live stock, handling of milk, cream, butter, cheese, and other things, which will appear as we go along. Will it pay to take a training that will enable me to handle the business better?

Suppose I try it without special preparation. I may have the entire equipment for turning out good butter. Good butter brings a good price; my cows are good, and all I have to do is to maintain what I have to make a good living. I milk my cows, separate my cream with a separator of approved type, handle my cream all right, and make a first-class lot of butter, and sell it all out, with calls for more. I may say, "What's the use of a fellow spending time and money to learn to dairy?" Things go along smoothly, and I am on a high road to prosperity. I go to the barn some morning and a cow is off her feed. What's the matter? I don't know. How can I know? I go for the veterinarian, and he doctors the cow up all right. With proper and not extensive training, either I could have, in all probability, saved his bill and my trip after him by doing the job myself, or may have been able to have warded off the attack entirely with proper precautions. I deliver my butter some day, and a customer tells me that it was not as good as usual. I had not suspected that something was wrong. I did not think that the occasional lumpiness in one quarter of one of the cows' udders told of a condition which might affect the

quality of the butter. I Or I had not suspected that one of my cows which milked "clear around" (i. e., never went dry) gave milk when near calving time that would spoil my whole product. Or my cream may have been held at too low a temperature and bitter butter resulted. I had not been able to see these difficulties in time to prevent the trouble with my butter, because I was not trained to look for them. I am all right so long as everything goes smoothly, but when something goes wrong it is too much for me. The business is complicated and requires constant skillful management to keep the product in proper condition.

The locomotive is a complex piece of mechanism, and I might get into the cab, pull the throttle and run out of Indianapolis O. K., whistle for all the crossings and stations, stop at the right place and start all right, and so long as nothing gets out of repair I can run indefinitely. Presently I hear something knocking. Something is wrong. Where is it? I must fix it before I go further. I hunt it up and may be able to fix it and may not. Suppose I am not, what then? I must telegraph for some one to repair the engine, and, it may be, for another engine to finish the run. In the meantime I have delayed traffic and my passengers are late. They miss connections they expected to make, and much ill-temper is generated. So long as the engine was in condition I could make as good time as the best engineer on the road, but I did not know enough about the engine to prevent it getting out of repair, nor suspect something going wrong in time to fix it myself. "A stitch in time saves nine."

To apply this to the dairy business. So long as nothing gets out of repair, so long as the cows maintain their health, so long as the butter maintains a good flavor, just so long can any man succeed in the dairy business. But let something go wrong. Where is it? And what is it? The special training for the dairy has for its object the pointing out of the conditions which produce a poor product, with the intention of avoiding these unfavorable conditions. Probably not all these unfavorable conditions can be avoided; probably not all diseases of the cow can be overcome, but a great many can be, and most of those diseases which are not successfully warded off can be cured by taking them in time.

Here let me name some of the things the special training for the dairy should include, and later explain, briefly, why they should be included. They are as follows:

Veterinary anatomy; physiology; hygiene; medicines; obstetrics; live stock judging; feeding; breeding; composition of milk, cream, butter, cheese; milk testing; dairy bacteriology as affecting the changes in the composition and quality of dairy products; practice in handling milk, making butter, cheese, etc., and in testing these products.

Now, why should we study these subjects? First, anatomy: Where is the stomach of a cow? How many stomachs has she? Suppose I have a horse with a knot on his shoulder point. It is obstinate and must be removed with the knife. There is a long, flat muscle extending over this

place. If I cut across this an injury is done which will not recover soon. If I cut between the fibers of this muscle it is not injured much and will heal up readily.

Physiology, the use of the parts that make up the cow: Hygiene, the conditions best conducive to good health; medicines. If the dairyman is to doctor his own cattle, as he undoubtedly should do, in all minor cases at least, he must understand the action of the commoner drugs and their application to the different diseases. Such information can be secured without extensive study. The dairyman would not have to study these as thoroughly as the veterinarian or the physician to still make a practical and successful dairyman. The best veterinarians can not save all the cases brought under their care. Then much less can the dairyman hope to cure all cases, but he can secure results well worth the cost of his training.

LIVE STOCK JUDGING.

Here again it is not necessary to become an expert judge, but the more nearly a man approaches expertness the more valuable is his judgment to himself in securing good stock. The need of training in this line will be felt if it becomes desirable to increase the herd by purchases, and more keenly, too, if one or two bad purchases are made. Such points as prominence of eyes, distance between legs, thinness of shoulders, size of "bread basket," size and character of udder, whether meaty or like a dish-cloth when milked out, room between hind legs to carry the udder, general wedge-shape of body, and other points are indications which should be carefully scanned in making a purchase.

STOCK BREEDING.

We should understand something of the principles of breeding, in order to secure with considerable certainty desirable offspring as a basis for our future herd. The principle that "like begets like," atavism, the value of line, cross, and inbreeding and the detrimental results of too close inbreeding, all should receive the careful attention of the dairyman. Since the dairy cow is largely an "artificial being," anyway, it becomes the more necessary to understand the principles of breeding to maintain the present standard in the future herd, and surely if we expect to improve, as all of us do.

FEEDING.

Having laid a secure foundation in the herd, it now becomes advisable to be able to feed properly. We must learn to compound rations from available foods so that we shall keep within close proximity to the feeding standard and balance our ration, at the same time giving a palatable ration and suiting it to the needs of each individual cow by practice.

The composition of milk, cream, butter, cheese, etc., should be known

in order that we may handle them the more intelligently in consequence of knowing what is changing and what we should change in converting milk to butter or cheese.

MILK TESTING.

We should know the proper temperature of milk and acid, action of acid on the milk, speed required in the machine, and the conditions likely to give inaccurate results, in order that we may avoid them. All are necessary to secure uniformly accurate results. This branch becomes of great importance in determining the profitable and unprofitable cows in the herd.

DAIRY BACTERIOLOGY.

It is advisable to know so much of this as to point out clearly that all dirt or filth, however, small in quantity, has immense quantities of bacteria with it, which, getting into the milk, may affect its quality by their growth. It should be known also that bacteria cause the ripening of cream, and that when one kind gets a "foothold" it tends to check the growth of other kinds, and, indeed, the lactic acid bacteria (that found in ripe cream), after a period of growth, tends to check itself. The lesson from this is, start your cream to ripening properly, and keep it at such a temperature as will be conducive to the growth of the lactic acid forming bacteria. If cream is kept at too low a temperature, an undesirable form gets started, and it is then more difficult to get the proper form to develop. All milk contains bacteria, and all the dairyman can do is to make the conditions unfavorable for the development of the undesirable forms. There is comfort, however, in this fact, that "by far the largest number of bacteria are harmless."

Having secured a knowledge of these subjects, and while securing it, practice. "Practice makes perfect," and "there is room at the top." are two quotations which should be kept in mind to spur us on to greater effort.

To sum up, there is scarcely a subject connected with dairying with which the dairyman can afford not to be familiar. And the more he knows of all these subjects the more intelligently and successfully can he handle the complexities of the dairy business. It has been said that a good dairy community is always found, regardless of other conditions, where there is a number of good dairymen.

Then why have a special training for the dairy? We answer, Because it makes us able to become good dairymen.

DISCUSSION.

Professor Plumb: I want to call the attention of the audience to the address of Mr. Barker and of Mr. Newsom. These young gentlemen have

been very intimately identified with the dairy school at Purdue. Mr. Newsom took a four years' course there, and made thousands of pounds of butter. He earned his education in the agricultural college making butter, and after leaving, spent four years at Purdue, and where he probably had as thorough and practical a training as a man could get in a butter factory, he has come home and gone into the butter business with his brother at Indianapolis, and is furnishing a fine quality of dairy butter. Mr. Barker is at present our dairyman at Purdue University. These are illustrations of some of the work the School of Agriculture at Purdue is doing, and which the dairy farmers of Indiana will get a very direct benefit from.

CITIZENSHIP AND THE INDUSTRIES.

PROF. T. F. MORAN, PURDUE UNIVERSITY.

The subject which I am about to consider with you for a short time this evening, as announced by the President of your Association, is "Citizenship and the Industries." I realize that this is a subject concerning which a good deal has been said in recent years, and one which has been occupying the public mind to a remarkable degree. I can not, therefore, claim for it the element of novelty. When speaking on a subject like this I am reminded of the article which Edward Everett Hale wrote for the Atlantic Monthly, about forty years ago, entitled, "My Double, and How He Did Me." It seems that a good New England pastor found his time so occupied by social duties that he had no leisure left for the preparation of sermons. He thought that ought not to be so. One day a very ingenious scheme suggested itself to him, and he made up his mind that if he could find a man resembling himself in personal appearance he would hire him to be his double to go about and attend the church sociables and eat the dinners while he could himself remain at home in his quiet study and prepare his sermon. He cast about and soon found a man named Dennis who seemed to fill the conditions. He soon struck a bargain with Dennis, had his beard shaved in the proper way, his hair trimmed, clad him in a conventional suit of black broadcloth, and he soon presented a very good double. It was necessary, however, to put Dennis through a "course of sprouts," as it were, a preliminary course of training, before having him enter upon his duties. The pastor said to him, "You must not, on any occasion, attempt to make a speech, for very obvious reasons. However, you may be called upon to make a few remarks occasionally. For instance, in the early part of the week some of my parishioners may

come to you and say, 'Doctor, I did enjoy your sermon of last Sabbath so much.' You should simply say, 'I am very glad you liked it.' This and nothing more. Then again after others have spoken you may possibly be called upon to make a few remarks. You should simply say, 'So much has been said, and on the whole, so well said, that I prefer not to occupy the time.' Then again, in order that you may not use the same speech on all occasions, you might say, 'I thoroughly agree with the sentiments expressed by the preceding speaker.' " Things went well for a considerable time. Dennis enjoyed his part of the program; but the day of reckoning came. It seems there was to be a great meeting over which the Governor of the State was to preside, and where a large number of influential speakers were to make addresses. Our good pastor was asked to take a seat upon the platform. He consented after being assured that under no circumstances would he be called upon to make a speech. However, as fate would have it, the train bearing the distinguished speakers was late. The audience, tired of waiting, became impatient, and finally called upon some of the local lights on the platform for speeches. Our good pastor was the first one called on. Dennis, who was there, was very slow to respond, because he remembered his instructions, but there was no way out of it, and he came forward and recited his first speech: "So much has been said, and on the whole so well said, that I prefer not to occupy the time." He sat down, thinking he had made something of a "hit." But the audience was unreasonable and wanted another. Dennis, still reluctant, saw no way out of it, and he came forward and recited, "I am very glad you liked it." Again the audience was not satisfied and insisted on a third. Dennis was very slow to shoot his last arrow, but there was no way out of it, and he came forward, reluctantly and triumphantly, for the third time, and as he did so a small boy up in the gallery called out, "I believe you are a confounded old humbug." Then Dennis said, "I thoroughly agree with the sentiments expressed by the last speaker." (Laughter.)

Now, when presenting a subject like this, I sometimes feel like, as Dennis said, "So much has been said, and, on the whole so well said, that I prefer not to occupy the time." I believe, however, that during the past few years the subject of American citizenship has been uppermost in the minds of the American people, and that some consideration of it even at this time can not be amiss. I have stated the subject, "Citizenship and the Industries," putting citizenship first, because while we may all have our different vocations in life, we are first and foremost citizens of the Great American Republic, and we must know the principles of citizenship before we know the specialties of our business. Secondly, I believe that is the proper form in which the subject should be stated. The historians tell us the Tudor period in England in the sixteenth century was characterized by great advance in all intellectual and material lines, but by political retrogression. This was the fact. It seems rather peculiar that

an age which furnished such great commercial, material and business progress, and some of the greatest literary products in the world's history, should at the same time furnish such an example of political retrogression. Such, however, was the case, and why? Simply because the best minds of the day were so engrossed in business, in commerce and material pursuits, that the business of the government and politics was given over to less worthy hands. That same condition has prevailed in this country to a very marked degree. Many of our best minds have refused to participate in politics at all. They have kept aloft, and the result has been, up to a comparatively recent time, to turn much of the political and governmental machinery of our country into hands unworthy to receive it. I believe, however, that in the last ten or fifteen years there has been a remarkable awakening along this line. We have had, as it were, a great civic renaissance, a great revival of learning along this line. Indeed, the so-called good citizen has come prominently forward and has said to the unworthy, "Thus far and no farther shalt thou go." The late Governor Matthews was certainly correct when he said, in speaking of the compulsory educational law, that universal education in a government like our own is more necessary than under a government of monarchical form. This is certainly true. In a government like ours, where we, the people, govern ourselves, we must know how to do so intelligently. Under a monarchical system like that of Russia, where all the power and authority emanate from the czar and his few confidential advisers, it does not make so much difference whether the people be educated or not. They have no power in the government, and their ideas will have no effect. But in a federal form of government like our own, or in a republican system, it is of vital importance that we, the people, after ordaining and establishing our constitution, should be intelligent enough to carry it out successfully. Guizot is certainly correct when he says a federal government is the most difficult of all to establish and maintain. Such it certainly is. The pages of history are strewn with attempts at federalism, and they were failures in every case until a republican form of government was produced in enlightened America. Glance with me for a moment at the history of governments. In the early morning of the world we had the patriarchal or tribal form, such as the Greeks had in the time of Homer, or the Hebrews in the time of Abraham, Isaac and Jacob. After that came the monarchical form in which the kings ruled, first absolutely, and afterwards with some limitations upon their power. After the people became enlightened and educated and civilized enough to govern themselves they insisted upon a participation in governmental affairs. It was the enlightened of the people that rose against the Stuart Kings under Cromwell and William of Orange and established a virtual republic. Likewise the intellectuality of France arose at the time of the French revolution and established the first French republic, and also the intellectual American revolutionist established our republican form of government in 1787. So it

has been in every country and in every age the highest type of government is the federal or republican type. So it is necessary that the people, in order to make a success of this government, should be educated and enlightened—in a word, civilized. Inasmuch as universal education is necessary for the success of republican institutions, it is well to ask what particular form of education is required to this end. I take it that general education enlightens us along various lines, but inasmuch as the specialist must have knowledge of his specialty, so, too, the American citizen must have a knowledge of the history, literature, government and traditions of our republic, if he is to reach the highest ideal as an American citizen. We have been accustomed for years, I might say for centuries, to look upon the study of history as one of great disciplinary and cultural value but of little value from a practical standpoint. I would not detract from the breath of culture that comes from the study of history, but there is another phase that deserves our attention, and this phase is the one which the American people, in particular, have been emphasizing in the last ten or fifteen years. There is a practical phase of the subject without which good and intelligent citizenship is impossible.

"History," says Paul Boileau, "is a great school of politics, and no one can be a statesman unless he is acquainted with the testimony of history and knows how it began by being an art, and later became a science, the most elevated and refined and instructive of all the sciences." I think that few of us would aspire to a knowledge of history in order that we might use that knowledge in practical statesmanship, but it is not only possible but highly desirable that we should have some knowledge of the history of this country, in order that we might use it in intelligent citizenship. As a matter of fact, at the present time we have greater need of intelligent citizenship than we have of intelligent statesmanship. I believe, however, and you will agree with me, I am sure, that our type of American statesmanship might be improved. I have no sympathy, however, with the cynicism and pessimism which attempt to make us believe that those representing us in national and State halls are unworthy of our support. I believe that the average Congressman of to-day, much as we may harp at and malign his eccentricities, is far higher in the standard of excellence than the average in days gone by, far higher than when Webster and Clay and Calhoun caused the whole nation to stand on tiptoe of expectancy. The questions confronting our Congressmen at Washington are correspondingly more numerous and complex than ever before, if we leave out the slavery question, which was not solved by statesmanship alone. Although there is great need of greater historical and political learning in legislative halls, yet the greatest need is among the masses of the people. Our great national questions are nominally decided in the halls of Congress, but really by the voters at the ballot box. Our Congress will decide what is to be the tariff policy of the United States for a certain time and what is to be the financial policy. But they are simply the ex-

ponents of our opinion. They are practically instructed by us as we cast our ballot at the polls. In order to cast that ballot intelligently we must know something of these great questions that are confronting the American people. Now, I do not mean to contend for a moment that good and intelligent American citizenship is made up wholly of a knowledge of history, political science, or political economy. There are many elements that must of necessity enter into the case. The man who furnishes a good livelihood for himself and his family has one of the fundamentals of good and intelligent citizenship. Honesty, frugality and thrift in public and private affairs are the most essential attributes in this case. However, if we would add to the good citizen that element of intelligence, he must have knowledge along the lines of the history and the institutions and the traditions of the American nation.

Now, then, why study the history of the past? What is the practical application of the history of the past? Why do we look into the oriental civilizations, the civilizations of ancient Greece and Rome? Simply for this, I would say, that the history of the past may be a guide to the future. I would not care one iota for the history of ancient Egypt, or Chaldea, or Greece, or Rome, except as these histories show us the law of human progress, and enable us to make a success where others have failed. I would not look into the history of the past out of any antiquarian curiosity, but simply to use it as a pillar of fire to guide us in our knowledge of the future. There has never been a time in the history of America when we did not have great questions pressing upon us for solution. For example, at the present time the American citizen is confronting the great question of territorial or national expansion. There are those, as you know, that tell us the United States would be making a serious error by getting possession of and holding territory in distant parts of the world, while there are others who proclaim joyously that the time has come for the United States to burst her narrow bounds and spread the glad light of good government and civilization into all parts of the globe. There are those who appeal to history to support and to combat the policy of expansion. For example, we are referred to Washington's proclamation of neutrality. We are told that in the time of Washington there were those in this country who favored an alliance with France, and others with England; that Washington considered the whole matter very carefully and decided to stand up straight between the two contending parties, and pronounced a proclamation of neutrality in which he said the United States is situated geographically distinct from European countries and will not enter into any entangling alliances with foreign nations. They also point you to the Monroe Doctrine. And so it is the advocates on one side or the other of this question are constantly appealing to history to sustain their views. A few years ago we were studying the problem of the income tax. We appealed to history in that case. We asked ourselves

how it worked years ago when we tried it in this county. We turned to the experience of England and other countries which had made a trial of this particular kind of tax. And so it goes. There is never a time when there are not questions to be decided by the American people. These questions can be decided safely only by a knowledge of the past. The past must, of necessity, be the guide for the future. I remember reading, a short time ago, a lecture by John Fiske, upon "Manifest Destiny." In the early part of this lecture there is a story of a dinner of a party of Americans in Paris during the civil war. After the repast was over it seems that speeches were made, and in the toasts that were given the central idea seemed to be the immense size of the American republic. One speaker, in proposing the toast, "The United States of America," said, "I give you the United States: bounded on the north by the British possessions, on the south by the Gulf of Mexico, on the east by the Atlantic, and on the west by the Pacific Ocean." The second speaker, however, was not content with these boundaries. He said, "I give you the United States: bounded on the north by the North pole, on the south by the South Pole, on the east by the Atlantic and on the west by the Pacific Ocean." Then there arose the third speaker, a very serious gentleman from the far West, and who said, "If we are going to take into account the manifest destiny of the Anglo-Saxon race and the future history of the great American republic we can not confine ourselves to boundaries so narrow as these. I give you the United States: bounded on the north by the Aurora Borealis, on the south by the procession of the equinoxes, on the east by primeval chaos, and on the west by the Day of Judgment." (Laughter.) Now, then, if at any future time the American republic should spread itself over territory so vast as this we may expect questions without number appealing to us for solution.

Another problem which is always before the American people is that of municipal government. We are more or less disposed to think that these great problems of municipal government apply only to the largest of our cities. In their aggravated forms, such is the case, but in all the cities of our land, both large and small, we have questions which ought to be solved. The remarkable growth of our cities in the last few decades has been little short of phenomenal. While in many instances the rural districts have not increased very much in population, and in some few instances have actually retrograded, our cities have bounded forward with marvelous rapidity. From the purely economic standpoint, there is much to be said in favor of this marvelous expansion, but it has brought with it economic and political questions almost without number, and the questions of police departments and boards of control, and paving and electric lighting, and transportation, and the care of the destitute poor, libraries and parks, and scores of others brought about by the marvelous expansion of our American cities, have made it necessary for the intelligent American citizen to turn his attention to the solution of these prob-

lems. Now, as a matter of fact, we have not made as great success of the government of our cities as we have of our States and nation. It is admitted on all sides that the governments of our cities constitute the least successful part of our republican institutions. Although our State and national governments come in for a generous share of our adverse criticism, our city governments, especially the large cities, are looked on as so corrupt that nothing short of Aunt Dinah's cleaning-up time or the twelve labors of Hercules, with a thirteenth added, will be able to cleanse them. A great deal of this is due to the fact that the American people are not educated in the science of politics. It is a well-known fact that when our city governments were established they were modeled on those of the State and nation, and without reason. In other words, power, without being confined to one responsible individual, was given to committees consisting of many persons. It was not easy under this government to locate the blame when anything went wrong. It took us quite a long time to see that concentration is the keynote of modern effective business management. We had a disagreeable experience at one time with King George and the colonial governors, and our forefathers conferred authority upon the broad shoulders of a number of men instead of one responsible individual. Now, however, the late Brooklyn type of charter is the one making the greatest advance, a charter similar to that which the city of Indianapolis has recently adopted. I do not mean to contend, however, for a moment that a good form of government on paper is all that is necessary. I do not mean to contend that a mere city charter is a panacea for all the ills that affect our cities. It certainly can not be so, but it is the only sure and safe foundation on which progress along these lines can be made. That was a magnificent work which the Rev. Charles Parkhurst and the Lexow Committee did in New York, but it was not reform in the best sense. It uncovered corruption without its removal. The work was useful, not complete, destructive, not constructive. In order to have reform in the fullest sense of the term we must have better governmental remedies. To expose abuses in that way calls the attention of the people to the abuses. But it is not reform in the fullest sense of the term. I know many writers and speakers prefer to pass over the mere form of city government, giving it a minimum of attention. They say that as long as we have our affairs entrusted in honest and efficient hands there is very little need for concern with regard to the form of government. Such is certainly true. The personnel is a matter of very great importance, but until we can entrust our affairs into the hands of those worthy in every way, we must give some attention to the fundamental principles of city government. We must look to the charter as long as those citizens who carry out that charter are not perfect in every way. A writer has said that he would prefer to have the laws of his city made by Baal, and executed by Gabriel, than the reverse. That is perfectly true. But inasmuch as we are not yet ready to put our gov-

ernmental affairs in angelic hands, we must insist on having our laws made and devised by those other than Baal. Obviously, the American citizen, to keep abreast of the times, must know something of the great economic problems pressing for solution. The latest is the question of the monopoly or trust. It is not my purpose to enter into a consideration of this great and timely question at this time, but if we attain the highest type of good and intelligent American citizenship we must study along these lines. It is needless for me to say that the political economy of to-day is very different from that of the days of John Stuart Mill and Adam Smith, and other great masters of economic thought. They had not the great problems to deal with which confront the modern American citizen. In our study along these lines in schools and colleges, and in the home, for the home is the greatest educator of them all, we can not hope to come to very definite conclusions with regard to these matters; we can not hope to settle these great problems which have been perplexing minds greater than ours for a score or more of years, but we can do this: we can arrive at some fundamental principles and get to thinking along right lines. After all that is the most important matter. Just as soon as we teach ourselves and others to think, a great victory is won. It is, indeed, a remarkable fact that in this age of general enlightenment, there is comparatively little real thinking done. It is the hardest work in the world to think, and we are only too willing to do it by proxy. We get our ideas from the newspapers, the magazines and the latest books, and it is a matter known to all that many of those who think the least are the most forward in expressing their opinions, not only on commonplace, everyday concerns, but upon the most intricate problems concerning financial and governmental affairs. Verily, "fools rush in where angels fear to tread." Many of these remind me of the old French king who regretted he was not present at the creation of the earth, inasmuch as he could have given the Almighty some very valuable advice on that momentous occasion. I believe John Wanamaker did a noble thing when he caused the street-car strikers and employers to sit down and reason together, instead of attempting to poison the mind of the employer against the employe. When the two contending parties can be brought together, and each made to concede a little—for it rarely happens that one is entirely in the right—we have a far more hopeful state of affairs than when standing apart, each refusing to concede one iota. It makes little difference to mankind in general whether there is any unanimity with regard to the interpretation of Browning, or the exact location of Plymouth Rock, but it is of the utmost vital importance that men should come to an understanding upon these important social questions, and any course which tends to inflame men's minds, and to widen the chasm which separates them can not be otherwise than detrimental.

Now, then, I have spoken somewhat of citizenship without saying very much with regard to the industries. The point I wish to make on this oc-

casation is this: There are many, especially in this intense age of commercial development, that are giving their time and thought and attention to the development of their business. All this is well. This is one of the fundamentals of good and intelligent citizenship. Something, however, is necessary besides this. There is a higher law than the constitution, and something higher than mere success in business. Success in business is an important means, but is not an end. I believe that we will attain the highest ideal of American citizenship if we have not only success in business, but also success in administering those duties devolving upon us as citizens of this great American republic.

The convention adjourned at 9 o'clock Thursday evening, December 7, 1899.

FRIDAY MORNING SESSION.

December 8, 1899, 9 a. m.

President Billingsley: It is but just, I suppose, that I should say that in inviting the Governor to be present with us here this morning, I promised him we would not require a set speech, so I suppose that what he will say to us this morning will be impromptu. I am very glad to have the pleasure of introducing to this convention Governor Mount.

Governor Mount: It always gives me pleasure to visit Wayne County. I have attended meetings before in this place, and in Centreville and in the beautiful city of Richmond, and my acquaintance with the people of Wayne County has always impressed me so favorably that it affords me indeed pleasure to visit your county at this time. Wayne County is inseparably connected with the history of the State, and she has furnished not only men of renown in the State, but men of national fame. Your county has long been noted for the intelligence of its citizens, for the progress it has made, for its industries and for its progressive farmers. Indeed, you occupy a very proud position. I am glad to meet with you here this morning, and yet I have found it very difficult to leave my office at this time. I at first partially promised your President that I would come last night, but I was under a previous promise to the ladies of Indianapolis to give a word of welcome to the officers of the Woman's Suffrage Council, whose meeting was to be held in that city, and I was notified that yesterday evening I would be expected to give that word of welcome. Hence it was impossible for me to be here last night, and if it had been left until to-day for me to decide I would have found it impossible to leave my office because of the duties demanding my personal attention. But having promised to attend this meeting and talk for a few moments, I feel this morning that I must fulfill that promise. You know it is sometimes said that a man will talk the most about that concerning which he knows the

least, and I think that will apply to my case this morning. I am asked to address the State Dairy Association. Naturally I would be expected to speak upon some theme pertaining to the dairy, and yet if a book were written about what I don't know about the dairy business it would be a very large volume, while but a few words would express what I do know about the dairy business. This does not imply that I do not feel an interest in the dairy business. It is a great industry. It is one of great moment to all the people of our country, to the farmers who do not engage in the dairy business as well as those directly engaged in it. I have always been identified with farming, and yet in my farming I have given no energy and no personal attention to the dairy side of that industry. I have never kept upon my farm a dairy cow. I believe that the average farmer, who is engaged in the general farming business, the growing of live stock and grain for the market, being situated somewhat remote from the market, I believe that such a man can not afford to engage in the dairy business. The general farmer who engages in the dairy business under unfavorable circumstances, performs a great deal of hard labor for which he receives a minimum profit, and I think that too many farmers subject their wives to making butter under very unfavorable conditions. I would criticise somewhat the farmer who undertakes the dairy business, and whose environments do not insure success along that line. I know of some men who go ten miles twice a week to take a few pounds of butter to market. If those men were good economists, and would compute the time and the energy that they expend for a very small income, I think they would turn their energies in some other direction, and relieve their good wives of the burden of butter-making under such circumstances. High class butter can not be made under unfavorable circumstances, and many of our farmers thus make butter and sell it to the huckster, or take it to town to compete with butter made under the most favorable circumstances. I have even argued before farm institutes that the average farmer should not engage in this business, by reason of these unfavorable surroundings. I took occasion a few years ago in farm institutes to warn the farmers against abandoning the beef breeds of cattle, and in lieu of the beef cattle, bringing on their farms the dairy cattle. I said then, "You will find in the course of time that beef will sell in the country, by the butcher that retails the beef, at a price beyond what the huckster pays you for your butter. I pointed at that time to the fact that from 1880 to 1890 the beef cattle in the United States had almost doubled in number by reason of the multiplying of the beef cattle on the great ranches, and during that time, when beef cattle were multiplying at an abnormal rate, the price of beef went down. The butter and the dairy business had a brighter outlook than the beef industry. So many of the farmers commenced purchasing one or two or three dairy cows and bringing them onto the farm. In 1891 the increase of the number of beef cattle ceased, and each year thereafter there was a decrease of from one to two million

head a year. That was a warning that the farmer should have heeded, and I called the attention of the farmers to the fact that the time would soon come when these conditions would be changed, and that beef would sell beyond the price of butter. So we have found that within the last year the best cuts of beef in the country have been retailing as high as fourteen cents in the country, and the huckster paying eight and ten cents a pound for butter. Now, it does not follow from this that the dairy business is not profitable. It is only a warning to those people who engage in the butter business or the dairy business who are not fitted for that work, and whose surroundings are not the most favorable. I remember a few years ago when the co-operative creamery craze prevailed in the State, and I was written to by a number of the agents asking me at certain farm institutes to speak in favor of the co-operative creamery, that they would be there on that occasion to endeavor to locate a creamery. These were men having a personal ax to grind, and they were making representations that could not be sustained, and inducing the farmers to take stock in co-operative creameries, a business about which they knew nothing, and who were not prepared for these conditions. Under such circumstances I again warned the farmers against that mistake, and many of these creameries proved great failures, not that a creamery can not be successfully managed, but the farmer was not educated up to that point, and the farmer who presumes that anybody can be a successful dairyman, the farmer who looks upon the dairy business in any other light than a difficult science, and an industry that requires the most careful judgment and display of ability, does not understand properly the dairy business. Now I have told you something about my lack of knowledge of the dairy business. I find that those men now who are engaged in raising the best class of beef cattle, are reaping abundant harvests. I have never, in all my experience feeding cattle, received the profits that I will receive this year from feeding beef cattle. Next week I will send from my farm two-year-old cattle bringing me \$75 apiece. There is profit in that, and it is money much more easily made than for the farmer, surrounded as I am surrounded, ten miles from any market of importance, it is a much better business than the dairy business. The dairy interest of Indiana, however, is one of the great interests of the State. No State in this Union is more favorably surrounded for making a success in the dairy business than is Indiana. We have the grass. We have an abundance of water. That used to be a very important factor in the milk business. (Laughter.) We grow an abundance of grain in the State, and then the great trunk lines of railroads have interlaced our State and have given us a quick outlet to the great city markets. I believe, I repeat, that there is no State in this Union more favorably located for successful dairy operations than Indiana. No business is going to succeed without intelligent management. No business can succeed with slipshod methods. The principles of science

and economics should be applied to farming as well as any other business, and the absence of these principles as displayed on many farms reveals the reason why there is not better success in the general farming business. When you come to the dairy business these principles are even more necessary. In the first place it is made possible now for the dairyman to know the profitable cows in his herd, and the unprofitable ones. He must apply the test of science and weed out the unprofitable cows. Then there is something more to be done after he has secured the best dairy herd. Then the proper care, and the proper environments for the successful operation of the dairy become a very important problem. Men must learn to feed with reference to the product produced, and the most of our farmers and dairymen have not yet learned that fact. They must feed with reference to what they desire to attain in the end.

Now, right along this line let me digress a little, and speak of one country that has made in the last fifty years the most marvelous progress perhaps of any country of Europe, or anywhere else, and that is Denmark. In 1860 the British Consul at Copenhagen said of the Danish butter that it was execrably bad. He said that the Danish people did not know how to make good butter then. What of the Danish butter to-day? It is the best made in the world. The conditions have not changed. They have the same environments now that they had forty years ago, the same land and the same soil. Why is it this marvelous change has taken place? The Danish government saw the necessity of applying science to that business, and not only to the dairy business, but to their farming interests in general. They organized throughout that country government schools in agriculture, schools in dairying, so that the Danish farmer could be taught the first principles and the main principles upon which success rested. So to-day, not only in the Danish schools is the science of butter-making and the science of dairying taught, but the government has employed agents that go over that country and visit the dairies, and visit the farmers. These men are experts in the business and they tell the dairyman how to make butter, and to-day they make the best butter in the world. They have experts going over the country telling the farmers how to prepare the best bacon in the market, and to-day the Danish bacon is the best sold in the markets of the world. It is better than our American bacon. They know how to feed for good bacon. We have not yet learned that. We feed our hogs almost altogether corn, and when they go to the market there is an excess of fatty substance, and not enough of muscle, and not enough of that delicate fibre that might be produced if different kinds of feed were fed to the hogs. They also teach the farmers how to feed to get the best results in the flow of milk, and the best results for the product they expect to make out of that milk, whether butter, or cheese, or whatever the purpose may be. They have made a great success there simply by changing the conditions. Fifty years ago Denmark was the poorest of all the countries of Europe. To-day it is the second richest, according to

the area, of any country in the world. What has brought about that change? In forty years the application of intelligence, enabling those people to be masters of the situation, have put them to the front. They have even taken another precaution there. They send their agents into the markets of the world to ascertain the wants to be supplied, the demands of the market, and then they proceed to prepare the very product that the market demands. In this way they become masters of the situation. That is what we want in Indiana. There is no reason why this State of ours should not be one of the best butter producing States in this Union, or in the world, for that matter, and that is a part of the work of this State Dairy Association, to emphasize the possibilities along this line, and then to try to educate the people up to the full measure of these responsibilities and possibilities along this line of industry. Already Indiana makes quite a favorable showing in the way of her dairy products. I asked our State Statistician yesterday how many dairy cattle there were in Indiana, to which question he answered 492,680; I also asked him the number of gallons of milk produced on the farm. These statistics were gathered by the assessor from the farm, and do not apply to the dairies of the State. There were produced on the farm 114,533,666 gallons of milk. There were produced on the farm 31,905,140 pounds of butter, and 1,085,403 pounds of cheese. This is quite a product coming from the farms of Indiana, exclusive of the dairy. This is only the beginning of the possibilities that may be attained in our State. So then, every farmer, if he is engaged in growing beef cattle, and sheep, and horses, or any other product of the farm, he is interested in having the dairy interests of Indiana fully developed, and to have as much talent and energy directed to that business as possible. Every farmer of ordinary intelligence understands that whenever a new industry is created in a county or in the State or in the land, whenever there is anything that engages the energies and occupies the time of men, outside of the farm, it accrues to his benefit. There will be that many more consumers, that many fewer producers on the farm. So we as farmers, whether we are engaged in the dairy business directly or not, we have an interest in the success of the dairy interests of the State. I as a farmer, never expecting to engage in the dairy business, and yet looking forward with a degree of anticipation to the time when I shall go back to that which I believe is the most noble and most independent vocation that can occupy the energies of man, even when I go back to my country home, I do not expect to engage, myself, in the dairy business, but I do not expect to lose my interests in saying and doing all in my power to have the dairy interests of Indiana succeed, because if that great interest succeeds it is one department of agriculture succeeding, and there will be more room for men engaged in farming aside from the dairy farming. Taking our country at large we have 60,511,960 cows. Gallons of milk produced in the United States, 5,210,125,567. Pounds of butter, 1,024,223,-

468. Pounds of cheese on the farms, 18,726,818. This is from the census report. This does not include all that has been made in the cheese factories and in the dairies of the United States. There comes now some other questions very closely associated with the dairy interests. That is the butterine and the oleomargarine manufactured at this time. This, in a large measure, has discredited the dairy interests, so far as the butter department is concerned. I believe that any food product, not deleterious to health, should be branded, and by law they should be required to offer it on the market for just what it is, and under no deception. (Applause.) I know sometimes our farmers are decoyed into favoring things it seems to me they do not favor intelligently. A few years ago an effort was made to prevent the combining of cotton-seed oil with lard, because it was injurious to those who were growing swine and tended to lessen the demand for lard. A man who was collecting statistics for the great packing houses, and to whom I made reports as to the growing crops and the amount of live stock and so on, wrote me, asking me to write to my Representatives in Congress and to the Senators from Indiana, asking them to oppose the bill that restricted the combining of cotton-seed oil and lard. He made this argument: First, he said, at the Exposition at St. Louis 10,000 farmers signed his petition. I said to him, "So much the more reason to appeal to the judgment of those men." He went on with his argument. He said, "These cotton-seed oil mills are great purchasers of the farmers' lard. They purchase many million pounds of the farmers' lard, therefore giving him a market." But at the same time he admitted that they used hundreds of millions of pounds of cotton-seed oil, thus supplanting the demand for pure lard by furnishing a substitute. Now if they combine cotton-seed oil with lard and that is sold for lard in the market, if it is not deleterious to health, I suppose it could not be absolutely prevented, but it ought to be branded "Cotton-Seed Oil" or "Combined Cotton-Seed Oil and Lard," so that if a purchaser wanted this cotton-seed oil instead of lard he might have it, but not deceive the people and put such a product on the market as pure lard. Along the line of laws regulating the dairy interests there are many things, it seems to me, that might be done, such as laws prohibiting the adulteration of milk; but the one law that is most needed, to my mind at this time, is a law requiring that this compound, whatever it may be, that is put upon the market as butter and sold as butter should be branded what it is, and there ought to be a heavy fine upon the manufacturer who does not brand it just what it is. There is the greatest need it seems to me for some stringent legislation along this line requiring butterine and oleomargarine and things of that kind to be branded what they are, and then for any violation of the law there ought to be imposed a very heavy penalty.

Now I hope this Association in its deliberations will discuss intelligently, and I know you will, all these questions pertaining directly to the dairy interests of Indiana, and then you should go to the Legislature asking

as far as the State can enact into law, such laws as will protect your interests, and secure to you what are your just rights. Yet I find sometimes it is very difficult to secure the passage of a law through the Legislature, how much the interests of agriculture, the live stock interests or the dairy interests may demand wholesome legislation, it is very difficult at times to get the ear and attention of legislators along this line. That was clearly demonstrated in our last Legislature when there was a demand made for a law giving better protection to the live stock interests of the State against infectious and contagious diseases. One of the best laws was prepared that perhaps has ever been put on the statute books in this State. The inspector of the stockyards at Indianapolis, who was the Live Stock Sanitary Commissioner of Missouri for a number of years, examined the law and said it was pre-eminently the best law that had been offered in any State. It was prepared by carefully summarizing the strong points of the laws of the different States, and yet when that matter came before the Legislature it failed, and to-day those who are engaged in sheep husbandry have no protection whatever, and there is nothing to prevent the spread of that disease which is so destructive to the sheep husbandry of our State. Our State Statistician tells us that nearly four hundred townships of Indiana are infested with that parasitical disease, and yet we have no law regulating the shipping, or counteracting the ravages of that disease. Farmers ought to scan carefully the record made by their Representatives in the Legislature, and if they can not for any private or selfish reasons enact such laws as will protect the interests of those engaged in live stock husbandry, they ought to see to it that such men are not given a position among the lawmakers of the State. (Applause.) So it will be with your interests. You will have to demand, and then be able to show by logic and reason the justice of your demands., I would not ask men to enact a law that imposes any injustice, or impinges on the rights of anybody else, but when laws are defeated simply for selfish reasons, as some laws have been defeated in the State of Indiana, then the people ought to rebuke the men who will not look to the interests of those who are the producers in our State. I would be glad to see such laws enacted as would tend to encourage and develop the dairy interests of the State of Indiana. I think it the best State in the Union, all things considered. We do not have millionaires in Indiana, nor do we have that palefaced poverty and want that is found in many places where people are not so near on an equality. I think we are making grand progress in all directions, and I hope in this march of progress that the State of Indiana is making, that this intelligent Dairy Association of Indiana will be in the vanguard of the march and develop your interests, and the interests of everybody in Indiana, because every interest in our State will be advanced when we build up that which is possible, a great dairy interest in Indiana second to none in the United States. Now, Mr. President, I think I have talked quite long enough about a subject I know very little about. I thank you. (Applause.)

EVOLUTION AND DEVELOPMENT OF THE DAIRY COW.

MRS. KATE M. BUSICK, WABASH, IND.

The term evolution when applied to the animal kingdom and used in its generic and widest sense covers every possible phase of development from the tough, slimy, granular, semi-fluid, shapeless protoplasm, or the living matter as distinguished from inert inorganic substances, from which all kinds of living beings are formed and developed, and to the properties of which all their functions and uses are ultimately referred, up to the complex, sublime and delicately constructed organism of man.

Evolution prescribes no limit to the perfection of both bodily, mental and spiritual attainments, which, as a progressive organization, the human race may ultimately reach; so, in like manner, we may not be able to as yet set metes and bounds to the development of the animal kingdom. The term evolution was first introduced by Professor Huxley, in an address delivered in 1869, on the subject of "Geology," and it immediately proceeded to raise a storm about the ears of its author, who was assailed by theologians on every side, as attempting to subvert the doctrines of the Christian religion. But, literally, it means nothing more than to unfold, unroll, or bring to maturity any living substance.

The doctrine of evolution presupposes that all animate being originated from a minute cell, produced by or from inorganic matter, by some occult process technically termed or known as "spontaneous generation." The more moderate, as well as modern, school of thought, as propounded by Darwin, advocates the belief that a few simple, low organizations were originated by a Great First Cause; and that from these sprang, by the "survival of the fittest," during ages untold, the successive stages of higher, better and more complex transformations, the several and varied species that, in process of time, arrived at such a high condition of development as resulted in the peopling of the then habitable portions of the globe, together with the flora and fauna of the present day. To illustrate, in following up the reasoning from cause to effect, and vice versa, of such philosophers as Huxley, Haeckel, Darwin and their several schools of followers the past fifty years, we find much speculation has been indulged in relation to what has been termed, in the phraseology of the scientific schools, "the missing link," or, the connecting link between man and the lower orders of the animal creation. We know such connection exists between the vegetable and animal kingdom, and to preserve the continuity of design, there must needs, so scientists argue, be a similar creation existing between man and the lower orders of creation, some intelligent activity to fill the hiatus that has heretofore, seemingly, existed. Our

government geological expert, Dr. Geo. F. Becker, who has just returned from the Philippines, gives a most interesting account of the anthropology of those islands, and thinks, after a vast amount of research, that there are excellent reasons for believing that the homo-sapiens, the upright walking or man-ape, is in reality the missing link, and supplies the one element lacking in the chain necessary to complete the continuous line of ascent—that these typical apes existed in the Island of Luzon in the epoch called “Pliocene,” toward the end of the “Tertiary Period,” which ended about 200,000 years ago when the Great Ice Age, or Glacial Period, terminated. We might elaborate the thought by tracing the connection still farther, showing that the black pigmies, or hairy dwarfs, of Luzon of the present day, now nearly extinct, and known as “negritos,” are the lineal descendants of these same great anthropoids, that increased and spread with such marvelous rapidity. In the slow rolling ages the arms shortened and the legs lengthened by the greater use of the one and corresponding disuse of the other, until they approached more nearly the similitude of the human, until now, we behold the dwindling race of the nearly extinct Negritos of to-day, inhabiting caves and the branches of the tropical forests, learning, by slow degrees, the use of the rudest and simplest of implements, with no language of their own save a few inarticulate sighs, grunts and guttural groans, supplemented by grimaces and a few of the simplest of Malay words, pronounced with the greatest difficulty. Living in the tropics, the slight covering of down that has superseded the hairy covering of their hirsute ancestors, renders fire unnecessary, and while subsisting almost entirely upon the fruits and nuts, so generously provided by nature, they are yet closely allied to the hairy dwarfs of Borneo, who live upon mice and such other rodents and small mammals as they can catch and devour raw. These and their congeners were assuredly the missing link so long sought by scientists as marking the line of progress as followed by tribes passing from the primitive state of the wild hunter, fisher, fruit and nut gatherer, with their primitive laws of personal vengeance and relics of the barbarism of superior brute force to the more peaceful habits and tranquil pursuits of the settled tiller of the soil. In like manner, except upon a lower plane, have the successive stages in the development of the brute or animal kingdom taken place, and a recital of the causes that have led up to the present phases of physical culture and improvement would read something like the Irishman’s description of how fine lamps were made in his country. Said he, in explanation of the process, “The lamp was made of a chunk of glass, the glass of a stone, the stone out of sand and lime, the sand and lime out of dirt, and begorra the dirt out of nothing at all, at all.” Taking then this basis of earth as our starting point, we may suppose countless ages to have elapsed before the first product appeared that received the divine encomium, that after its kind it was good. In other words, it fulfilled the purpose of its being and the object for which it was created. The years rolled on. Ages came

and went. Centuries swept their slow length along and vanished in the dim corridors of the past. Improvement, however slow, attended the taray, leaden-shod feet of progress, the world slowly but surely advanced and grew wiser and better, "though many an eon molded earth, before her highest, man, was born." The behemoth and ferocious monsters of the jungle grew tamer and less hideous and repulsive, as man laid his subduing touch upon their untrammelled ferocity and brought them in subjection to his will. The wool-shod feet of silence have left no echoing foot-falls adown the misty lengthening aisles of the long ago, as the centuries have sped onward in their ceaseless flight. In the mystical legends of the nebulous past, where it is asserted there were giants in the earth, not alone among the sons of men, for the mighty scrolls of nature, written by the unerring finger of God, in the everlasting characters of the rock-ribbed hills, and the vast fossilized remains, hidden and imbedded deep in the huge labyrinths of the foundations of this old world of ours, tell the story in unmistakable utterances that the animal creation was on a scale commensurate in its gigantic proportions with the human race of that same period. There were no pigmies in those days, either of man or beast, for nature never makes a mistake or creates a monstrosity—that is left to the ingenuity of man to produce. But in process of time, by natural selection and the law of "the survival of the fittest," and the constant upward tendency of improvement of species, which, with the vast cataclysms of nature that destroyed untold millions of these monsters, exerted a refining influence upon the remainder, that in successive generations elevated and improved the species. It took uncounted ages to effect these changes, because all the fixed operations of nature are necessarily slow and almost imperceptible, only the eye of Omnipotence, that notes the sparrow's fall, can measure or record them.

The principle of natural selection and theory of improvement of species was practiced at a very early day, the first historical account of which appears in the somewhat questionable transaction that took place when Jacob so adroitly turned the tables upon his father-in-law, Laban, in that famous cattle bargain, which has given the patriarch the well-deserved title of "Father of all jockeys," and I've no doubt the enthusiastic advocates of the modern Holsteins could, if so minded, trace the line in an unbroken descent from the ring-streaked, speckled and spotted cattle, with which Jacob so cleverly juggled Laban, down to the black and whites of the present day, and by so doing, laid the foundation for his immense possessions as the cattle king of ancient times. That the principles of evolution were well understood even in that remote day, was thus demonstrated, notwithstanding we moderns are so apt to think that wisdom has had her birth and mayhap will die with us, when mankind first began to observe these developments and improvements.

The first real effort approximating evolution in the animal creation was put forth by the human race toward the bettering of existent condi-

tions in the domain of the domestic animals, as I have instanced in the contract between Jacob and Laban. Modern wooers may think the old gentleman placed an extravagant price upon his daughter; but he evidently knew her worth, as the sequel proved; this by way of digression. Ever since then, with varying degrees of success, men have put forth the best efforts they were capable of in bettering their domestic animals. The horse, the animal par excellence of the warrior, far outranking the humble, patient cow, was the pride of princes and the joy of kingly rulers. But as the arts of war, in time, gave place to the peaceful pursuits of agriculture and commerce, the bovine race gradually forged ahead, and as men's appetites became satiated and cloyed with blood, they developed a taste for the pleasures of the table, until butter and milk, from being the dainties of the luxurious and wealthy few, became the necessities on the frugal tables of the toiling poor, and the cow, the poor man's friend, is found wherever civilization sets the imprint of her foot. It will suffice for our purpose to take the two most prominent types of the modern dairy cow, to exemplify our subject, viz., the Holstein-Friesian and the Jersey, the one standing as the exponent of milk and cheese, the other of butter. Both these breeds are what might be termed composite, being the result in either instance of the union or crossing of various and different breeds for the ultimate purpose of securing certain characteristics. Thus, for generations the dykes of Holland have coralled within its borders the black and whites known as the Holstein-Friesians, with their enormous udders, so justly celebrated for their immense milk yields, qualities perpetuated from one generation to another. Their origin is lost in the mists of obscurity, but I am inclined to think, with some of our noted cattle authorities, that they were originated in the far East, and brought in the train of the Crusaders upon their return from the land of the Saracen. Long feeding upon the lush pasturage of what has been for hundreds of years their native home has engendered the milk habit to such a degree that they are now acknowledged to be the champion milk and cheese producers of the world. One stands lost in amazement when confronted with the record of a cow that can produce over 100 pounds of milk in twenty-four hours. Just think of it, a single animal yielding twelve gallons of milk by actual measurement in one day! But this enormous yield was not the result of accident, or arrived at in a day, or by chance. Ah, no! Years of patient toil were necessary to achieve this result. Generations ago a careful herdsman selected his best and heaviest milking cow and trained her and her offspring to continue this heavy yield, by constantly culling out the poorer and lighter milking specimens, and breeding only to such sires as could show by their pedigreed ancestry that they were the lineal descendants from the heaviest milking strains. In this way the habit of large milking capacity was formed and fixed. Like mother, like daughter, like sire, like son, was the principle adhered to, and the theory that "like begets like, or the

likeness of some ancestor," was rigidly enforced and practiced. There was no taking chances, or making accidental couplings. Nor was similarity of blood and breeding the only thing taken into consideration. The environments of the cow, her feeding and surroundings were equally carefully considered and studied; her taste, dispositions, likes and dislikes, peculiar idiosyncrasies—for cattle have their idiosyncrasies as well as their owners—her ability for largely consuming and assimilating the various kinds of food, as well as her capacity for converting these same foods into the largest amount of milk consistent with the safety of her digestive organs, were of vital importance. The temperature at which she was kept, the amount, kind and quality of the liquids she drank, were likewise carefully studied. Her excretions, whether from the skin, lungs, kidneys or bowels, were accurately noted, and these voidings carefully compared with the nature and amount of nourishment, solid as well as fluid, given, and recorded from day to day. She was curried, brushed, bedded and groomed and exercised as particularly as a favorite race horse. Her temperature, time of milking and quantity of milk recorded with mathematical precision; the least variation from her normal condition instantly observed and as quickly corrected, if possible, by her attendant; in short, the treatment accorded her was as gentle and humane from a scientific standpoint, as near perfection, as could be attained to, and with the result that while in a natural or wild state the cow would give barely sufficient milk for the nourishment and sustenance of her calf, and then only for the space of a few months, gradually decreasing in quantity until it dwindled away to nothing, under the conditions I have described the flow of milk continues for 365 days in the year, and in such enormous quantities as almost to surpass belief. How many years were thus spent in producing a Pauline Raul or a Clothilda of the Netherlands? No records were kept nor were their highest ambitions realized in a year or a day. Only by the slow, laborious process of selection and care, kept up year by year, and generation after generation, with possibly an advance here and a retrogression there, one generation a success and mayhap the following a disappointment, but still a slight improvement all along the line, all these marked the gradual development of the animal so nurtured and bred, and herein lies the grand secret of success. A noted authority in educational matters was once asked by an anxious mother "when the education of a child should begin." "Before it is born, madam," was the prompt but curt reply, and so it has been with the development of the dairy cow. Each successive generation should be a marked improvement over the preceding. Come we now to speak of that other great branch of the dairy family—the Jersey. Unlike the great milch cows of Holland, while the origin of the Jersey is in dispute, it is not altogether so obscure. The first historical statement concerning them was published by the Rev. Philip Falle in 1734, and though their origin may be mythical and legendary, they are commonly supposed

to be also a composite race. From their very striking resemblance, in their shaded colors of silver gray and fawn, delicacy of bone and frame, yellow skin, black muzzle, tongue and switch, together with small ear, slender horn and lean, dished face, to the zebu or sacred cow of India, it has been conjectured that they were originally descended from that source, or that she largely contributed to the formation of the breed. Still others contend that the cattle of Norway afforded some admixture, asserting that the old wild sea rovers first took their cattle to these Channel Islands of Jersey and Guernsey, and, crossing them with the small, hardy Brittany race, laid the foundation for the Jersey of to-day, and yet others are of the opinion that the Norman or Cotentin race largely predominates in the Jersey. Be that as it may, careful selection, with systematic crossing and a judicious guarding of the purity of the breed, has brought it up to its present state of excellence as a butter cow. For centuries she, too, has been bred for a specific purpose—for her choice quality of milk and butter. She is not and her most enthusiastic admirers and advocates have never laid claim that she is a "general purpose" cow, but she is and ever will remain the dairy cow par excellence, where cream and butter are concerned, because she has the capacity for turning her foods into these two articles instead of converting them into flesh and tallow, for the covering of her own frame. All I have said in regard to the feeding and care of the Holstein-Friesian applies equally to the Jersey. But in order that the high excellence of our dairy breeds be maintained, we must be ever on the alert that no backward steps be taken. Forward and ever forward should be our watchword. Better and still better our motto. That "there is no excellence without labor" is as true in keeping up the standard of the dairy cow as in any other branch of business. The time has gone by when the ability of a cow "to rustle" for herself or starve was the standard of excellence, and to make two and one-half to three pounds of butter a week the measure of her ability. To be a success a cow must first provide for her own needs, after that all additional in the way of milk and butter is profit and goes to her owner, and if with ordinary care and feed she will give for her owner five, six or seven pounds of butter a week she remunerates him amply for a little extra care and feed, and materially enhances the amount of the income, while the labor and cost of keeping may be but a fraction more. Then, too, the superior qualities of her offspring are an additional source of profit, for who does not know that a heifer calf from a superior butter maker or milker is nearly always in demand and commands a better price than the offspring from a "scrub," although the poor scrub may only be the result of cruel and inhuman treatment by her careless owner. Many a real good cow is ruined by the gross neglect of a brutal owner. And so I bespeak for all domestic animals care and kindly treatment. for God gives us these creatures for use and not for abuse, and I verily

believe we shall all, women as well as men, stand in judgment one day for our treatment of the helpless, dependent animals committed to our care. Let us then take heed that we faithfully observe the Golden Rule, not only in our intercourse with our fellowmen, but in our treatment of our dumb friends as well. For if our Heavenly Father takes cognizance of the sparrow's fall will he not remember that "the merciful man is merciful to his beast," and reward him accordingly? In conclusion, let me urge upon every one better care, better feed, better treatment, and these better results will be sure to follow.

THE CONFORMATION OF THE DAIRY COW.

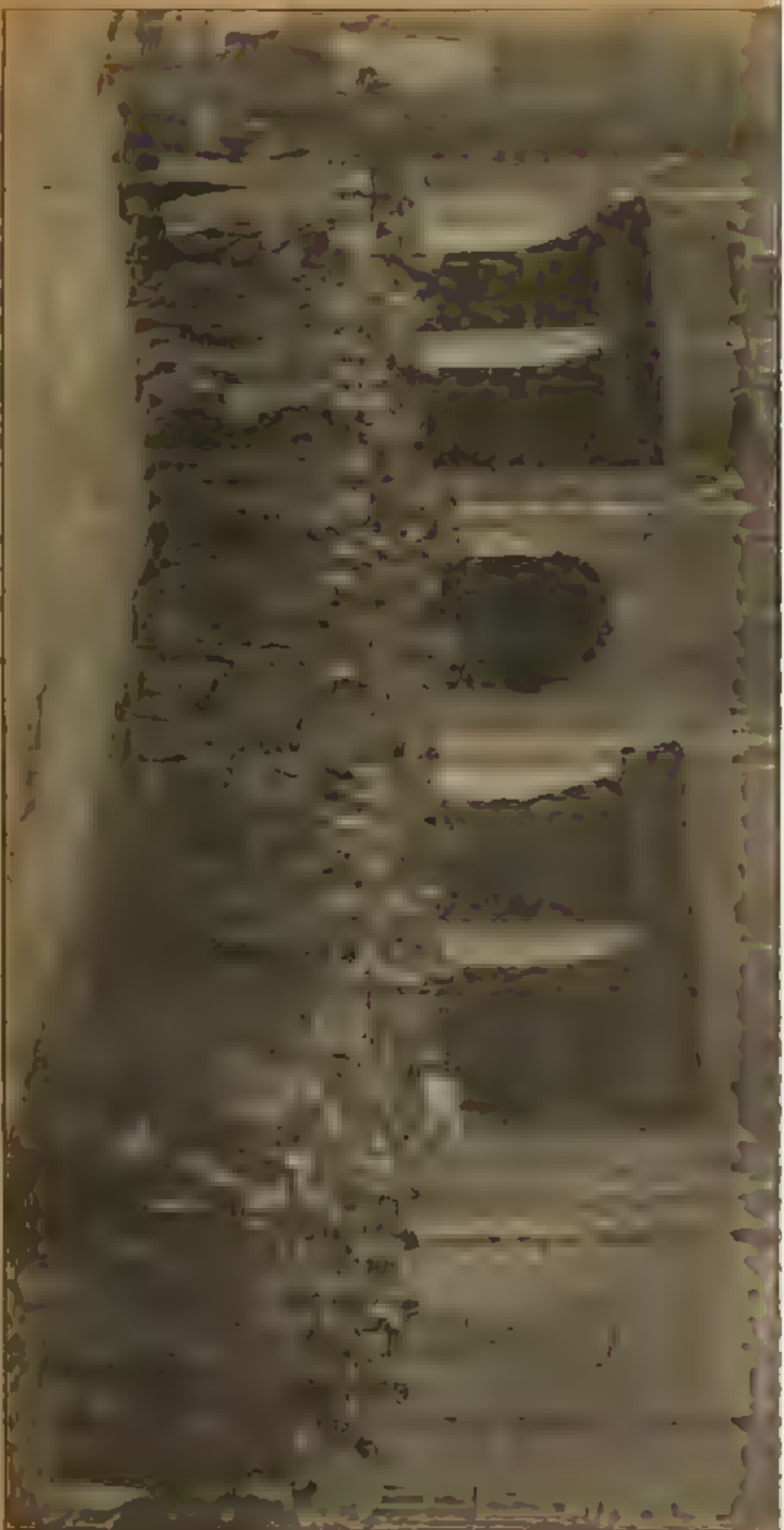
MORTIMER LEVERING, LAFAYETTE.

Mr. Levering: Mr. President, Members of the Indiana Dairy Association, Friends of the Dairy Breed, and Friends of the Beef Breed—We seem here this morning to have had both kinds, and we have been afraid something may have been said that would rather discourage our dairy breeders from their favorite breed, and possibly make them think more of the beef breeds, or particularly of the Shorthorns. Something has been said here in comparison. It has been said by the Governor that choice cuts of beef have been lately retailed at fourteen cents, and at the same time butter has been sold at twelve cents. By way of comparison, I will say, who ever heard of these choice cuts being sold at one dollar a pound or fifty cents a pound, while every day thousands and thousands of pounds of butter are sold in the eastern market at one dollar a pound and fifty cents a pound. Again, it takes two or three or four years to develop about fifty pounds of meat in that animal to sell at that high price of fourteen cents, while we can show animals that have produced 300 or 400 or 500 and way up to 1,100 pounds of butter every year, and keep it up year after year, and even sell it from an animal of that character at fifty cents a pound. Is there any comparison? Then it is said that two-year-olds will sell for \$60 or \$70. You will find people in this country who advertise calves of dairy breeds for sale, and in those advertisements, to save correspondence, they will say, "No calf less than \$200." There are people in this room that have priced calves within the last few days at from \$100 to \$500 apiece, for dairy purposes. So we have our side of it.

The subject that has been given me this morning is "The Conformation of the Dairy Cow." It will not be a Jersey cow nor a Holstein cow, but a general dairy cow. As our friend, Mrs. Busick, has mentioned the word "composite" in her paper, we will say that is a composite dairy cow.

You take a photograph of ten or fifteen men, and put them all on the same plate, and you have the photograph generally of a very good looking man, or take ten or twelve women and it will make a picture of a very good looking woman. So you may take ten or twelve different breeds of dairy cattle and combine them in the same way and you will have a general cow which we will say is a composite dairy animal. Now a great deal is said at meetings like this which is just telling people what they already know. I think what we need most as dairy breeders is to have a little more courage. We are too tender hearted. We are too timid. Whenever a dairy calf is born that has a pretty face and large, weeping, lustrous eyes, it appeals to us to keep it. But we ought to look at the business end of this calf, and if it does not have the proper dairy form give it the knife, and then we will develop so that everybody can have cows that are worth keeping and worth feeding. My friend, the Hon. Mr. Reser, has given you a little history of our century. I was very much interested in it, and we congratulate ourselves on living at this end of the century, but I am sorry to say that while great development has been made in many lines, a great many people are still using the same churns that they used at the beginning of this century. You may take the average farmers throughout our great State, and you will find they are giving their wives nothing modern in the way of creamers or places to take care of the milk, or good crocks, or good churns or anything of that kind. You will find them still working with an old dash churn, with a loose top, and possibly only half of it left, so that every time the dasher is moved it lets in air and the milk flies out, and then they have to go to the barn to get their dairy salt, from salt that costs seventy cents a barrel, and throw the hay seeds out of it, and then they are supposed to make fifty cent butter. If farmers will treat their wives right, and give them proper appliances, and let them have a chance, they will show you they can make good butter, and then the reputation of the dairy cow would not suffer. Now, there is a style of architecture in building which appeals to us as long as we see it, and there is a style of architecture in cattle that tells us just what they are supposed to be. If we see a substantial stone building without any windows, and a high wall around it, we suppose that to be a place of confinement, a place we are not anxious to get into. We see another building made according to a certain style of architecture and we take it to be a church. It has the ecclesiastical style of architecture. We see another building and it is a dwelling house. The value of that dwelling house is not in its exterior. Any one who visits our cities like New York, or any other large cities, will find they make their houses extremely plain on the outside, just brown stone; but when you get inside of these houses you are amazed. That which makes the value of that dwelling house is the character of the inside machinery, and its plumbing, and its lighting facilities, its heating facilities, its sanitary condition, and in general the business part of that house

inside gives it the value. Now, we look at a dairy cow. If she has great, handsome, lustrous eyes, is of a beautiful color, and is fat, we think that is a nice cow. A great many people buy that kind of a cow, and I may say they are in a large majority. If there is any one thing that I think there is an overabundance of in this country it is inferior cattle kept for dairy purposes. People do not look at the business end of them. I said a few things about cows at the State Fair at Indianapolis, and it was along the line of selecting animals for use as dairy animals. It is difficult to buy an animal that has proven herself to be a great milk cow, or a great butter cow. Every one knows that if a cow develops into a great milker and she can make fifteen to twenty-five pounds of butter in seven days, the whole family is in love with that cow. You may talk to a man about selling that cow, and he will say to you, "My wife would not sell that cow for your farm. She is half of our living. She makes so much butter a week. All the milk used in our food prepared for the table comes from this cow." You must remember that a woman is pretty near at a standstill if she has no milk with which to do the cooking, and many a woman in town that keeps a cow has kept her neighbor's baby alive, and sold enough to buy herself many Christmas presents, besides furnishing all the milk for their own use and some butter to sell. You must learn to tell a dairy cow or dairy animal when it is young, before it has developed. As soon as the cow makes fifteen pounds of butter with her first calf, I tell you you can not buy her for less than \$200, and that is beyond the dreams of the average farmer and more than they should pay, because they can get animals for less than that which will answer their purposes and be just as good. But it is possible to tell, outside of the breeding, what an animal when quite young, either a male or female, will do in the dairy line, and there is an education which the dairy breeders of the State should be posted in, and as I said before, should give the knife to unworthy animals, to those we know will not develop. In the matter of breeding of course I am a stickler. I believe a great deal in heredity, but I do not believe it will do everything. You may know that a race horse like Electioneer might have 1,500 colts, and only 160 of them be in the list. There is the same proportion of unworthy individuals in animals of the dairy breed. A dairy animal may have a great milk record, and its progeny not have a record equal to it, but we want to get an animal that is backed up by a good pedigree. I believe in breeding pure-bred animals, because when you get an animal that is an extraordinary milker or producer you can get an extraordinary price for her. We know of animals that have made twenty-two pounds of butter in seven days, that are fifteen-sixteenths pure-bred. If this animal just had that other one-sixteenth of pure blood, so it might be registered, it would sell for five dollars to one, because men who have large means will not buy a grade animal, no matter what the record is. It is important to know what constitutes the machinery for making milk, and butter, as



Mr. Lovering continues his remarks on the street using a row to illustrate the point he makes

important as it would be to know the interior of the house I mentioned, as to what the interior machinery of the house is, and as for the conformation of this cow, both old and young, it may be well for us to adjourn to the front of the building where a cow has been brought for our inspection, and while we are there we can go over these points in detail and continue what we have to say along this line.

DISCUSSION.

Mr. T. F. Gallagher, of Chicago: I have not very much to say, except that the quality of the butter exhibited here to-day is as fine as I ever saw. I am pleased to say that the State of Indiana need not be ashamed of the quality of butter they are making, but it is to be regretted they are not making more of it. The quantity is where the trouble is. The interest is not being taken in this State in dairying that I would like to see, and that a great many friends of Indiana would like to see. The average score here to-day is 95.02, which is a decidedly high score, and I would suggest that the members should make some effort to send each one a tub to the National Convention which is to be held in Lincoln, Nebraska, in February. I feel positive they would bring away the banner for the highest score for all the exhibits of the different States.

The Convention here adjourned at 12 o'clock, noon.

AFTERNOON SESSION.

Cambridge City, Ind., December 8, 1899, 1:30 p. m.

President Billingsley: I first built a square silo, and I put into it about all the ingenuity I could to make it tight and secure, and all that. While I have been using it six years, I have always had trouble keeping the silage in the corners of the silo, and I am very clearly of the opinion that it is hardly possible to build a square silo but what you will lose some silage in the corners. I next built a small tub silo to try it. I believe that was the first in that part of the State, and I found it kept the silage good out to the very staves, and this last summer I have built another considerably larger. There are two prominent advantages in favor of a tub silo, it keeps the silage better, and there are no corners. You can pack it evenly all over and all around next to the staves, and you will have no spoiled silage, that is, after you take off the top, except you may have a little at the openings of the silo where the silage is to be taken out. It is necessary to provide openings for that purpose. Aside from that you will have perfect silage if it is well put up from top to bottom, after the top is thrown off. Mine is made out of two by six lumber. The first is twenty feet in height, and is ten feet in diameter. It was just simply a trial. The last silo I built sixteen feet in diameter

and twenty feet high; twenty-four perhaps is preferable, for the reason the deeper the silo the more compact your silage will be and consequently will hold more. Now there are two kinds of openings, or, I might say, three. Suppose you were to take two of these staves and saw them obliquely, and put bars across here, and build them on each side around your opening here, and saw it so when it is sawed out it will come right out and that will make your opening for that silo, and down further put in another opening and so on down. That is one way to make openings, or you may saw them so they may be taken out on the inside. That is perhaps preferable, because the silage will press them closely into the joints, and then in feeding, when you come down to the point, you have to dig down into the silage so as to remove the door; another way is to put on two cross pieces up and down here, and put irons across and fill this in here with sections so you may take the sections out as you feed down, one after the other, and those sections will be fitted into a groove right back in here, on the inside, so that they also are pressed against the pieces that run up and down. That makes a very effective and satisfactory opening, because it is open at all times all the way down. I intended for this to show both openings more satisfactorily. They did not understand me and have made a very crude affair, but perhaps it will serve the purpose. I built a brick wall just the length of a brick in width, and leveled it up with cement, and set the staves in the center of the wall. I have cemented the surface on the inside in both of my silos. I have used iron rods, half-inch rods, but I have had trouble on account of the iron connections not being made just right, and I have had several of those rods break. If those rods are made of Swedish iron, a half inch is sufficient. Otherwise, using a common quality of iron, it ought to be three-fourths inch, or you may make connections taking this band here, and taking a 4x4 oak or 2x4, and up to the width of two bands, that is, the space of two bands, and let the bands go through that piece of oak, and have a nut on that side, and screw it up both above and below, and you may make as many connections as you may be disposed to in that way. I believe the wood connections are more satisfactory, because the silo swells after you put in the silage. The real difficulty is this swelling of the staves. They become moist and are likely to swell, especially if they are dry when the silage is put in. It is quite a strain, and the wood connections will give some leeway for the hoops to expand, so that the silo may be accommodated. In my experience, there is no silo that is built that is cheaper and yet better. You can build one of these 14 feet in diameter silos that will hold from 80 tons up to 100 tons. You can build one at a cost of about one dollar a ton for its capacity. That is, if a silo holds 80 tons you can build it, all told, for \$80, or 100 tons you can build it for \$100. With my experience, I can build it for less, but you will probably not, in your first experience, be able to do that, that is, for any less than one dollar a ton capacity. After the silage is taken out your hoops will be loose, and if they get a little loose,

you can screw up the taps so as to draw up the bands and secure the silo against the entrance of the air.

We have on our program a paper by Mr. Husselman, on the "Covered Barnyard," and as Mr. Husselman is not present and can not be, I will take a few minutes to speak of it. I have not been satisfied, in my experience of four or five years in dairying, with fastening my cows up in stalls and compelling them to stay there any length of time, although my stalls are four feet in width, and some of them double in order to accommodate two cows. It gives them a little more room and I feel a little more freedom putting two together. Yet I have not been satisfied with that. Some of my best milkers have injured their udders being confined within a certain space to lie down, and not having the ease and comfort they ought to have. A few weeks ago I determined to build a covered barnyard, and I built one 50 feet in width and 72 feet in length, and I put racks in that barnyard, racks that slope down to a point, and I have laid troughs out on each side, 18 inches, and in feeding the hay out of the racks everything in the way of leaves or heads will drop into the troughs, so the cows can eat them afterwards and they will not be wasted. I have a water tank in this yard which is surrounded by a wall of sawdust one foot thick packed hard. The water passes underground from another water tank I have near the well, through a pipe, and comes out into that tank. The covered yard has windows and ventilation, and after the cows are milked in the evening they are turned out of their stalls and pass into that open barnyard, and we have it bedded with straw about a foot thick at first. It will pack down some, and they can go and eat what hay they want and go to the tank and drink what water they want, and then they can lie down quietly and comfortably. About the last thing I do of an evening is to take my lantern and go out to the barn, and hold up my lantern and look at the cows lying down on the straw and chewing their cuds, and I go back to bed satisfied. I believe we will come to it, most of us. I was very much surprised to see the amount of water my cows would drink after being fed and milked. We feed our grain rations in the stalls during the time they are milked and the remainder of the time I expect them to spend in that barnyard. As soon as the warm days come I have a lot adjoining which I can turn them out into and let them have the sun and some exercise there. Still they can get about all the exercise they need in this covered barnyard, and I believe it will contribute largely to their comfort and to an additional flow of milk. When we kept them in stalls we bedded them every evening during the winter weather carefully, but at the same time they were more or less in a cramped position and could not lie down with that ease and freedom that a cow that is a heavy milker with a large udder would like, and I have had two or three of my cows injure their udders when confined in stalls.

DISCUSSION.

Mr. Woods: Give a brief description; what it costs.

Mr. Billingsley: I have a barn one one side, and I had before I built this, a high solid fence around this barnyard, so that the cost of the building was not so great as if built entirely separate. I used one side of my barn, so that it cheapened the cost of it. I covered it with roofing paper and painted it. I used three-ply roofing paper. I couldn't get any considerable fall, and it was not best to cover it with shingles, and the gravel roof is too heavy. I have another covered space by my barn 45 feet square which has a gravel roof on it which I use to drive into with the wagon.

Mr. Adams: I understand it is all sided up from bottom to top.

Mr. Billingsley: Yes; and in addition to that, I expect to line it on the outside with two-ply paper, perhaps next week, so as to make it as good protection against wind and cold as I possibly can. Of course I have had to provide for ventilation.

Mr. Adams: Do you have closed windows?

Mr. Billingsley: I have openings on the upper side next to the barn which I can open or shut as is necessary in order to give the necessary ventilation but there is a passageway 16 feet in length that the air passes out at any time through the other shed. I am very well pleased with it so far, and it seems to me to be so natural a thing for the cow after she has eaten and filled herself with water to lie down and chew her cud, and lie down at her pleasure and get up when she wants to with perfect freedom, that it is just what it looks to me to be, the most natural thing that I could provide for her.

The report of the Judge on Exhibits is received and approved.

Report of the Auditing Committee to which was referred the report of the Treasurer is received and approved as follows:

Cambridge City, Ind., December 8, 1899.

We, the undersigned, appointed to audit the Treasurer's report, herewith report that we have done the same and recommend its adoption by the Association. No receipted bills accompany this report, but this is mainly due to the fact that the Treasurer was compelled to file receipts covering \$500 with the Auditor of State, in order to secure the use of the State appropriation for the year ending November 1, 1899.

Signed:

C. S. PLUMB,
O. A. STUBBS,
S. B. WOODS.

Report of the Committee on Resolutions is adopted as follows:

Whereas, Food adulteration has become a serious menace to the health of consumers, and whereas the manufacture and sale of artificial dairy produce as at present conducted, is on a fraudulent basis, being an imitation of superior dairy goods, and thereby injures the financial interests of the farmers of the United States to the extent of untold millions of dollars; therefore, be it

Resolved, That this Association recommends the enactment by Congress of a pure-food law, to be administered by the National Government for the protection of both the consumer and producer.

Resolved, That we heartily endorse the aim of the National Dairy Union in its efforts to procure effective national legislation bearing on the regulation of the manufacture and sale of oleomargarine, and that we urge the hearty co-operation of every individual member of the Association.

Resolved, That the Secretary of this Association be requested to use his earnest efforts to secure through the Secretary of the Central Traffic Association a reduced rate for our meeting of 1900; also, that we extend to Professors of Purdue University our sincere thanks for their earnest and active work in educating the people of Indiana in better methods of agriculture, and especially the line of improved dairying.

Resolved, That this Association highly appreciates the efforts put forth by G. W. Drischel, of this city, for his untiring efforts, both physically and financially, toward making this meeting a success.

Resolved, That the special thanks of this Association are due and extended to the orchestra who entertained us with splendid music.

C. B. BENJAMIN,
W. S. COMMONS,
—— HILL,
J. M. KNOX,
G. P. NEWSOM.

Professor Plumb: There is a point which I think is worthy that the Association give its serious consideration to in connection with those resolutions. It specifies in those resolutions that the United States Department of Agriculture shall be the one to enforce the law, if one is passed, controlling the manufacture and sale of artificial dairy products. I believe it is not wise for this Association to say the Department of Agriculture shall do this work. It seems to me it would be wiser to amend that by saying the National Government, for the reason we can not tell what circumstances may surround the enforcement of the law, and we do know that the most efficient department the United States has for the enforcement of its laws is the Treasury Department. Therefore, if we simply put in that it be enforced by the National Government then we are not committing ourselves to any department.

Mr. Van Norman: I move to amend the report along the lines suggested by Professor Plumb, by substituting the words National Government for Department of Agriculture; which motion is seconded and declared carried.

The Committee on Nomination of Officers submits the following report, which is adopted:

We, your Committee on Nomination, beg to submit the following report:

President—C. B. Benjamin.

Vice-President—J. V. Shugart.

Secretary and Treasurer—H. E. Van Norman.

Executive Committee: C. B. Benjamin, J. V. Shugart, H. E. Van Norman, J. J. W. Billingsley and C. S. Plumb.

O. A. STUBBS,
S. B. WOODS,
J. V. SHUGART.

The Committee on Amendments to the Constitution submits the following report, which is adopted:

We, the undersigned, Committee on Revising the Articles of Association, recommend the following amendments to the same:

Add to Article II. After the word Association, insert: The Secretary is authorized, whenever necessary, to employ an Assistant Secretary of his own appointment, to assist at the Annual Meeting, who shall be paid for his services as the Executive Committee may decide.

Add to Article IV: Or by majority vote of the Association at the Annual Meeting.

Add to Article VIII: The Treasurer shall also furnish sufficient bond as determined by the Executive Committee, to guarantee all moneys owned by the Association handled by him, the said bond to be deposited in such national bank as may be designated by the Executive Committee.

Add to Article X: When the Association receives State aid, the Treasurer is authorized to meet the expenses of the Executive Committee in all cases of called meetings when executive business is transacted.

Signed:

C. S. PLUMB,
C. B. BENJAMIN,
H. E. VAN NORMAN.

Professor Plumb: Now there is one point that might possibly have come up in connection with this matter that I desire to make a motion on. At the last Annual Meeting of the Dairy Association it was voted to give the Secretary-Treasurer a salary of fifty dollars a year. The Secretary-Treasurer has a large amount of business to do. He has to read the proof

of this book, and it means an immense amount of work. I know that from personal experience, and there are others who have been in the same position who know something about it. Now, very unexpectedly to us, we did not get any State appropriation at the last meeting of the Legislature, and consequently the Association is short in its funds. It is going to require the greatest economy to make both ends meet, so we can not allow that motion to prevail that was carried, but it seems to me that the work of the Secretary has been so untiring, and so devoted to the cause of the Dairy Association that he ought to have some recompense, and, therefore, I wish to make a motion that the Executive Committee shall take steps to see that the Secretary shall receive financial compensation for his services to such an extent as they can see their way clear to provide from the money on hand.

Motion is seconded and carried.

Invitations are received to hold the next Annual Meeting at Crown Point, and one to hold it at Hobart, in Lake County. On motion of Mr. Benjamin, said invitations are referred to the Executive Committee with power to act.

MOISTURE IN THE CURING ROOM.

S. J. TAYLOR, LOGANSPOUT.

In this land of dry, hot summers, the subject of moisture in its relation to the curing of cheese is worthy of careful consideration. Too often the cheese maker neglects to give the subject any thought, and does not recognize the importance of having a properly constructed room in which to cure his cheese. Inspection of the conditions under which cheese is cured in this country will show that, as a general thing, the details of the curing room receive little or no attention. The curing room is built as cheaply as possible, no attempt being made to control the temperature or moisture content. Very often cheese is stored in rooms the temperature of which undergoes almost as much fluctuation as the outside air.

The result of this is that not only is the temperature usually far too high to ripen the cheese properly, but the air is also too dry. The sudden changes are also very undesirable.

The proper conditions for curing are a uniform temperature of about 60 degrees and a moisture content of 85 per cent.

Cheese is a compound of nearly equal parts of fat, casein and water. A portion of this water is absorbed from the surface of the cheese by the air in the curing room. If the air is very dry it will absorb more water

from the cheese than if it is already saturated with moisture. Cheese held in an ordinary curing room for twenty days will shrink about 4 per cent. in weight; that is, four pounds of water will be absorbed from each 100 pounds of cheese. If 1,000 pounds of cheese is made daily at a factory and the shrinkage is 4 per cent., there is a loss of forty pounds on each day's make, or about a barrel of water in six or seven days. If the curing room is well made and the temperature is kept down low the shrinkage will not exceed ten pounds per 1,000 pounds of cheese. This is a saving of thirty pounds daily or 900 pounds per month, which, at 8 cents per pound, amounts to \$72. Then the rind is not so thick as it is when cured where the air is too dry and the cheese is more uniform in quality. Another source of increased yield lies in the use of a less amount of acid than would be allowable with a high temperature. All in all, the gain will amount to at least 5 per cent.

No matter how carefully the curing room may be constructed, some means must be provided for keeping the temperature down. The best and cheapest method of accomplishing this lies in the use of either the sub-earth duct, deep well or ice house. Local conditions will largely determine which of the three methods is best.

The cheapest way is by means of the well, providing it can be sunk to a depth of at least 30 feet. In ventilating by this means the breeze is caught by a wind-cowl and is led through a tube down to the bottom of the well. A galvanized iron pipe six or seven inches in diameter, beginning just above the water, should extend upward to within 10 feet of the surface, then it should be run off horizontally until under the curing-room, thence up through the floor. Prof. King recommends the use of several small pipes leading upward with the interspaces packed closely with earth. In any case, the well should be as deep as possible, to a reasonable depth. A ventilator should lead out of the curing-room in order to allow the warm air to escape and so create a draught.

Where the deep well can not be had, a horizontal sub-earth duct is the next best. To be effective it must be at least 100 feet long, and it ought to be something near 12 feet deep. The duct may be a single large flue, or it may consist of several small ones. The multiple duct cools the air more effectually, but the air does not pass through it so readily, especially when the wind is light. So then, we may say, that generally the multiple duct is the more effective; but on days when the wind is very light the single large one gives the best satisfaction. Drain tiles are generally used in constructing the ducts. Eight to ten rows of five-inch, five rows of eight-inch, or three rows of ten-inch tile will either of them answer the purpose. The wind cowl is used with duct just as with the deep well. The cowl must be at least fifty feet in height providing there are no obstructions, such as buildings or trees, in the way. In that case the cowl must be carried above such obstructions.

Sometimes the nature of the soil makes the use of the above methods

impossible. In that case we must have resort to the use of the ice house. It is built adjacent to the curing room, with several openings leading from the bottom of the ice house into the curing room. The ice must be packed so the air can circulate around and under it. Air is admitted above the ice, and as it cools it becomes heavier and settles. This causes a current to flow through the openings into the curing room, forcing the warm air out at the ventilator at the top.

Here is an illustration showing how the moisture content is affected by a change in temperature. Let us suppose that the outside air is at 83 degrees and has a moisture content of 75 per cent.; that is, the air contains 75 per cent. of as much moisture as is possible for it to contain. In passing through the duct it is cooled to 60 degrees and the temperature of the curing room is 84 degrees. At 83 degrees air will hold 12 grains of water per cubic foot. If it is saturated to 75 per cent. of its capacity it will hold 75 per cent. of 12 grains or 9 grains.

At 60 degrees it will hold but 5.76 grains of water per cubic foot. The excess moisture, or the difference between 5.76 and 9 is deposited in the duct, leaving the air to enter the curing room in a saturated condition. At 64 degrees, the assumed temperature of the curing room, it will hold 6.57 grains of water per cubic foot. The air entering the curing room contains 5.76 grains of water per cubic foot. After heating to 67 degrees the relative humidity will be as 5.76 is to 6.57, or 87 per cent.

It will be seen that cooling the air decreases its moisture-holding capacity—which is the same as increasing its moisture content, while warming the air increases its moisture-holding capacity—which makes it relatively dryer.

The psychrometer furnishes the most practical means of determining the proper moisture conditions. This instrument can be made by anyone. Put a number of thermometers in a dipperful of water at 50 degrees, then heat to 60 degrees, then to 70 degrees and to 80 degrees. Select two that register alike at all these temperatures. To the bulb of one of them a wick is fastened, which must hang in a flask of water an inch below the thermometer. The evaporation from the bulb lowers the temperature. If the air is dry there will be a greater difference in the readings of the two thermometers than if the proper moisture conditions prevail. The instrument should always be fanned a minute or so before taking the reading. If the moisture is right, there will be a difference of about 3 degrees in the reading after the fanning. If the difference is greater than this the air is too dry; if less, it is too moist. Use rain water or condensed steam in the flask. Care should always be taken to see that the instrument is in proper working order.

All efforts at regulating the moisture content of the curing room will come to naught unless it is well insulated against the outside air. The United States Department of Agriculture recommends no less than three air spaces in the walls. In my opinion, the proper place for the curing

room is in the basement of the factory. Here, better than by any building above ground, can the temperature and moisture be regulated. I wish to call attention to the fact that not only does the sub-earth duct increase the moisture content in a majority of cases, but it regulates the moisture as well. If from any cause the curing room is too damp, a well-constructed duct will remedy the evil just as effectively as it will dryness of the air.

MILKING MACHINES.

CHARLES S. PLUMB, B. S., LAFAYETTE.

Director Indiana Experiment Station.

Most men dislike to milk cows, and the average milker is not adapted to the process of milking. This lack of adaptation of the milker to the cow is responsible for many a defective udder and spoiled disposition in the farm herd. There is not that sympathetic presence and manipulation of the udder that rapidly brings the milk down and away, but rather a struggle between man and cow for the mastery, which almost invariably ends up to the detriment of the latter.

Many men have recognized this situation, and so have sought by mechanical means to secure the desired milk. For a half century, at least, various forms of milking machines have been invented, varying in character from simple to complex and more often than not utterly absurd in construction.

In 1880 Major Alvord stated (1) that between forty and fifty patents on milking machines had been issued since 1849. In order to secure some information of a definite character on this particular phase of the subject, I went with much care over the volumes of the Official Gazette of the United States Patent Office from 1874, when volume I was published, up to November, 1899. A part of these volumes were unbound and in a small degree were incomplete, but notwithstanding this fact, I must have secured a fairly complete list of the United States patents that have been issued on milking machines, or "cow milkers," as they are frequently designated, during the past twenty-five years. Excepting with a few of the earlier patents, all listed in the Official Gazette are accompanied by drawings showing the style of the instrument or machine, with one or more claims as to the construction of the patent.

During the past twenty-five years seventy-three different patents have been taken out, in the United States on milking devices, the last one being

(1) Dairy Farming, p. 446.

filed on February 1, 1899. The greatest activity in the filing of such patents occurred in 1893, while from 1891 to 1897, inclusive, a larger number were patented than for an equal number of years in succession at any other period. New York State has led the list in this movement, filing thirteen patents, while seven have been filed by Iowa people, four each from Maryland, Wisconsin, Minnesota and New Jersey, three from Pennsylvania, Massachusetts and Missouri, two each from Nebraska and Illinois and one each from Indiana, California, Connecticut, Ohio and South Dakota. Fifteen of sixty-nine States and countries are foreign applicants, of which Scotland numbers six, Denmark four, Sweden two, and England, Australia and Canada one each. This list is not necessarily complete, as has already been explained, but it is without doubt very nearly correct, if not quite so.

These various types of milking machines may be divided into four groups. First, drainers, where the simple work of the milking tube only is attempted; second, suckers, where by suction by means of a vacuum the milk is drawn off into teat cups into which the teats fit; third, squeezers, where by means of rollers and pads the teats are operated upon to squeeze out the milk, and fourth, suction-squeezers, where these two operations are somewhat combined in one machine.

The simple milking tube was the earliest form used, and the first seven of which I have record were of the drainage type. The simplest type is one milk tube used for insertion in the teat. Various types of this have been patented. The next form combines four tubes, with rubber connections, coming to a common center and one pipe entering a can or milk cistern. One simple phase of the suction type is shown by a patent taken out, where a bicycle pump is attached to the can, for pumping the air from the can and so creating a vacuum into which the milk must enter. The commonest form of suction machine, however, calls for an insertion of the ends of the teats in teat cups, and then by air pump run by hand or power, withdrawing the milk through tubing connecting the cups and vacuum chamber. The squeezers are intended to imitate hand manipulation, and so the teat falls in between pads or rollers where an oscillating motion or grip squeezes down the teat and forces out the milk. In order to get the best results, some have attempted to combine the suction and squeezing process. The squeezers, however, are usually complicated and undesirable.

In examining into the make of sixty-eight patents, so far as I can determine, twenty-nine use suction, twenty drainage, seventeen squeezing, and two a combination of the two latter. During the ten years, however, from 1890 to 1899, inclusive, of thirty-four patents, nineteen have used suction, ten squeezing and five drainage.

Many of these patents are absurdities of the most pronounced character. One man patents a scheme by which he pumps off the milk into a tub with neatness and dispatch, milking two cows at a time. One man

has a scheme, in which a long chain gearing extends from a shafting under the ceiling overhead, along down beside each cow to a point below and in front of each udder, to drive pumping machinery there. Another proposes to attach near each udder a complicated arrangement of cog-wheels, pads, rollers and pipes, assuming at the beginning that each cow is as gentle as a dove. These are only a few examples given to show that common sense has not been largely used in the designing of milking machines up to this time.

In 1880, Alvord wrote (1): More than half of the American patents for milkers have been upon machines which have aimed to imitate the natural motion of the calf in sucking. Ten of these patents were issued to L. O. Colvin, beginning in 1860, and it is upon the general plan of his invention that the greatest hope now lies for perfecting a practically satisfactory cow milker. At that time Alvord spoke highly of Durand's machine, made in New York, which was a suction machine with teat cups and pumping outfit.

It is highly probable that but few of the milking machines patented have ever been given a practical trial, and but a very few of them have ever come to the general attention of progressive dairymen. The inventors, themselves, for many years found that their ideas would not go in practice, and as late as 1878 the Royal Agricultural Society of England offered a special prize of \$250 for an efficient and satisfactory milking machine, to be exhibited at the Bristol show, but none were entered for exhibition or competition.

Among the various machines that have been exhibited and put in practical use in America or Europe, the following in recent years have met with most attention. The Murchland and Thistle of Scotch make, the Nielsen of Denmark, the DeLaval of Sweden, and the Cushman and Hussey of the United States. All of these machines, however, are patented in the United States, and all but the Murchland and DeLaval have been used in America, and perhaps these have also.

The Cushman machine is made at Waterloo, Iowa, and a patent was filed for this on September 16, 1895. This machine is regarded as an improvement of the old Hoover and Allen patent, which was filed September 29, 1891, this patent, I understand, being sold to Modestus J. Cushman, of Iowa. This is the best known American machine, and it has been used to considerable extent in a practical way. It consists of a vacuum chamber and weight, an air pump and suitable tubing connecting vacuum and pump and a main milk and lateral pipes. At the end of the lateral pipe is a compound tee and four teat cups. The air pump is worked by hand or other power, and various valves in the pipe are adjusted, the teat cups are applied to the teats and milk is drawn by suction into ordinary eight-gallon milk cans, situated at the lower end of the main milk pipe, which is usually located very near the floor of the front of the stalls before the

(1) Dairy Farming, 1880, p. 446.

manger or stanchion. A weight suspended by a rope over a pulley, connected with the lateral milk tubes, stretches these from the teat towards the front of the animal, thus pulling or applying traction to the teat. The manufacturers claim that more satisfactory results are secured by this traction, than when not used. The cost of this machine complete for ten cows is, or was, \$200.

A Cushman machine was used from August till the next May on the dairy farm of the late Robert Lockridge at Racoon, Ind. The outfit here consisted of fifty-two lateral tubes, or a capacity for 104 cows. Mrs. Lockridge stated to me that when her sons looked after the use of the machine, it gave satisfactory results, but in the hands of hired help it was very unsatisfactory. One of the laborers on the farm, who assisted at the milking during its use, told me that it was necessary to discontinue its use because it ruined the udders and the teats, milking the parts unevenly, and causing trouble. The Lockridge farm was at this time one of the most prominent dairy farms in Indiana, and every effort was made to keep abreast with the times in modern labor-saving improvements.

The Hussey machine was patented by N. W. and A. H. Hussey, of Mt. Pleasant, Ohio, the patent being filed October 31, 1893. This is a simple suction machine, which E. C. Bennett describes in *Hoard's Dairyman* (October 1, 1897), as simpler than the Cushman and easier to clean, though it appeared a little harsher on the cows than the other. The simplicity of construction of the Hussey machine made a very favorable impression, there being simply an air pump, vacuum chamber, main air tube and but one short rubber milk tube and the teat cups for each cow.

The Murchland machine is made by William Murchland, of Kilmar-nock, Scotland, and a patent for the same was filed February 3, 1891, in the United States. This is a fairly simple suction machine, using air exhausting apparatus, and using a liquid column automatically, preventing excess of suction. A surcingle is placed over the back of the cow, to which is suspended the teatcup apparatus.

In 1897 it was my privilege to see a Murchland machine in operation at the Highland and Agricultural Society of Scotland Show, at Glasgow. A number of cows were kept in a shed, and these were milked by a Murchland machine. During the process of milking, the cows complacently chewed the cud, paying no attention to the machine attachment. An attendant assured me that no injurious effects resulted from the continued use of the machine, and directed my attention to one cow which he stated had been milked constantly for six years by this process. This cow was an Ayrshire, with a large, fine udder.

This machine has been extensively tried in Europe.

The Thistle milking machine is made by Alexander Shiels, of Glasgow, Scotland, and patent was filed on the same in the United States on June 1, 1893.

This is also a suction machine with vacuum regulating apparatus.

This machine has a special teat cup, with a rim to grip the root of the teat and an internal lip, separate from the rim, and having a movement in the interior of the cup independent of the rim.

The Thistle machine has been the most written of of any of recent make in Europe, and has perhaps had the most extensive trial of any yet made. A few miles from Ayr, Scotland, is the dairy farm of Mr. Alexander Cross, known as "Knockdon." There are few establishments in Europe or America of so high a character as this, it being the best that money and intelligence can produce. In a visit there in 1897, Mr. James Muir, the manager, informed me that they had put in a Thistle machine at considerable expense, used it for three weeks, and discarded it. It resulted disastrously in its use in three ways:

(1) Some of the quarters of the udder were milked out before others were, and sometimes even blood was drawn and damage done to the cows. (2) The milk would not keep sweet over twelve hours when drawn with the machine, and as this farm makes a specialty of Cheddar cheese, it is important that it be sweet when used. (3) It was found difficult to keep the machine clean. One rarely now sees a reference to the Thistle machine.

The Nielsen machine was invented by Jens Nielsen, of Copenhagen, Denmark, and patent on this was filed in the United States on December 1, 1891.

This is one of the "squeezer" machines. The description in the Official Gazette states that it is a "combination with a frame of two pairs of rocking and reciprocating pads for pressing the teats, of connecting bars holding the corresponding pads of the two pairs parallel during their movements, and mechanism for moving the pads of one pair toward each other, while the pads of the other pair are being moved from each other."

This machine was on exhibition at the dairy barns at the World's Columbian Exposition in 1893. Mr. J. H. Monrad also writes of seeing it in operation on a herd of seven cows near Lombard, Ill. (1) He states that the cows, with one exception, "made no more fuss than many a cow would with a stranger milking her the first time." He also noted that the machine milked apparently perfectly clean, if the handle was turned long enough, and that the cows appeared to like the manipulation.

The DeLaval Lactator, as it is called, is the invention of Carl G. P. DeLaval, of Stockholm, Sweden, patent on which was filed in the United States on September 9, 1895. This is unlike any of the other machines described, in that it combines a pulling and squeezing operation with no suction, the idea being to imitate hand milking as much as possible. Professor Woll has written an interesting account of this machine and its work on the experimental farm of Lilla Ursvic, about seven miles from Stockholm, Sweden. (2) The machine is not described in detail further than it is made of aluminum, weighs about 15½ pounds, is very compli-

(1) Dairy Messenger, July, 1893, p. 187.

(2) Hoard's Dairyman, October 23, 1896, p. 707.

cated and has hundreds of parts. There are four similar parts in each lactator, one for each teat. These work from a common axis, independent of each other and alternately, so that the different teats are pressed on after each other. The milking is done by pressure of the teats and agitation of the udder in something like the same manner as in case of hand milking. The milk comes out of the teats in small jets at the rate of about a quart a minute. It is, however, regarded as slow in its action. The milk streaming out of the different teats, is conveyed by means of a rubber "teat protectus," fully enclosing the teats, into a common small aluminum bowl, which has a movable lid, where the amount of milk coming down can be observed, and also a rubber ball closing the opening below. When the milk runs down into the bowl, the rubber ball will, of course, rise to the surface of the milk, and thus allow the milk to run out from this. This bowl, or cup, is connected by rubber tubing with the milk cans hanging in front of and above the cows. The milk is transferred from bowl to can by suction, which acts as long as there is any milk in the bowl, after which the ball will close the hole and no further suction will take place. If the machine is not disconnected at this time, its action on the udder will be a harmless sort of massage. One horse-power is required for each five machines used. This one was run by electricity. About twenty-three cows were milked by this machine, which was in operation about a year, and Woll comments favorably on its work. While elaborate plans had been made to make and lease these machines to farmers on a royalty, I believe that its manufacture has been discontinued.

The use of milking machines in general practice is a thing to be desired where a large number of cows are to be milked, but up to this time they have invariably been discarded for some one or more of the following reasons: Too complicated; improper construction; difficulty in keeping milk tubes clean; injurious effect on udder, teats, or milk; slowness of operation.

I wish to quote from a very interesting letter written to me January 26, 1897, by a gentleman in Minnesota, who operated a machine of American make for some months:

"This one was started on August 27, 1896, and was taken on thirty days' trial, being a fifty-cow machine. The cream goes to the ——— Hotel, Minneapolis. The second week we used it they complained that there was a bad smell to the cream, and it soured quick, and during the hot weather quite a lot of it did sour, but after a time we heard no more about the cream. Mr. ———, the inventor, put the machine in, and as soon as I saw what it was like, I asked him if he ever studied bacteriology. He said, 'No.' I told him I thought he ought to. The machine was used thirty days. Mr. ——— stayed about a week after it started, and from that time it was under my care. At the end of the thirty days, they asked further time and got thirty days more. We were having some

trouble to keep it clean. Then they put in a small six horse-power boiler in the creamery near the barn and I steamed it out twice a week. This seemed to help clean it, but I have never found it clean yet. Even after steaming it, I find in the tees small adhesions of milk and also find them in the main pipe. They make no provisions for cleaning. We use a rag and a wire for the main pipe and a small brush for the tees, and clean the latter twice a week and the main pipe not so often. Early in the winter our cows began to dry up, and some that they claim were always persistent milkers. Several were dry before they were in calf again, so I determined to satisfy myself. I had my son take a pail and follow immediately after milking with the machine. He got twenty-four pounds of milk from fifteen cows. We were then milking thirty-four, and two of us doing it without the machine in thirty-five to forty minutes. In the barn where I milk were three cows just bought, that had been milked with a machine about two weeks. They gave the most milk in the stripplings. The foreman then sent the other man back with the pail and he got six pounds from one and two from another. The next morning a man was sent to follow him with a pail. He took fifty-five minutes to milk nineteen by machine and the stripper got twelve pounds of milk. The next time, sixty-five minutes and ten pounds of stripplings. The new cows still continue to give from three to seven pounds after the machine. By the Babcock test, the best test after the machine was where we took the longest to milk, and was 3.8 per cent. down to 3.4 per cent. fat, while our herd milk tests 4.6 per cent. We have one cow that is rather hard to milk and the milker machine will not milk her, so she has been milked by hand and is doing the best of any cow in the herd now. I think the machine is a success on some cows, but not on all cows. It requires a lot of hand work to get all the milk. The cows do not object to it, but stand very quiet, and once in a while one will lie down with it on."

This is in reference to the best known machine that is made in America. The manufacturers tried to make an improvement on this patent by providing a cold water flushing of the pipes after milking, but that does not clean satisfactorily.

Milking machines have been used on many large farms in Europe and America during the past ten years, but so far as I can learn, the operation has not become permanent on any one of them, for some of the reasons already set forth. Probably the experience I have quoted from the Minnesota letter fairly illustrates the experience of many others. This certainly was somewhat similar to that on Knockdon farm in Scotland.

Men overlook one fact in the use of mechanical milking, and that is that it lacks the sympathetic action found in the hand of a good milker. Professor Marting, in reporting on the work of the Thistle machine at Hamburg, lays special stress on this point. According to J. Moldenhower,¹ who quotes from Marting's report, as the milk is conducted

(1) Hoard's Dairyman, Sept. 10, 1897.

through glass tubes into the milk vessel, it was observed not to flow in a continuous stream, with even pauses, as when milked by hand, but off and on; the pauses were longer, even as long as one minute, so that the cow seemed to be milked dry, when after a while the milk would again begin to flow. This shows that the machine has not the ability, like the hand, or the sucking calf, to affect the whole nervous system of the cow in that desirable manner which through the milking puts the cow in such a temper as will assist in the separation of the milk. When we bear in mind that only a comparatively small part of the milk is already produced in the bag when the milking begins, and that the far greater part is separated by the milk glands during the process of milking, then the above objection is a serious one, and as it was supposed, so it was found, that when at last the milking machine was removed milk could still be gained by afterwards milking by hand. Still more objectionable was the fact that after removal of the machine the teats appeared considerably red, which seemed to prove that the teats are more irritated than by hand milking, and that possibly a continued use of the machine might injure the cows.

In the writer's opinion, no milking machine yet devised has become a demonstrated success. Some are naturally better than others, but no one thus far has, in every way, proven a desirable addition to the equipment of the dairy. Men, however, will continue to experiment and devise, and it is not unreasonable to believe that the time will come when large herds will be generally milked by machine, though there are many doubters of this view. This opinion of Marting has many supporters.

THE WHY OF MILK TESTING.

H. E. VAN NORMAN, LAFAYETTE.

With the introduction of the cheese factory, about 1850, came the conscious need of a method of determining the relative value of the milk delivered by different patrons, a need which was increased by the establishment of the butter factory or creamery, about 1870, and the knowledge that all milk was not of equal value for either cheese making or butter making.

The first step was the cream gauge, a graduated tube in which the milk was allowed to stand and the per cent. of cream shown was taken as an index of the value of the milk. But the per cent. of cream was found to depend more on the surrounding condition, such as air, temperature, etc., than on the actual butter content.

The first creameries gathered the cream from the farmers and hauled

it to the factory to churn. The great difference in value of cream collected was more noticeable even than in the milk for the cheese factory. Test churns were introduced. These were simply small churns in which a sample of each farmer's cream was churned separate. These were very unreliable, because it was difficult to make the small pats of butter uniform, and the quality was not up to that of the large churning, and it could not be mixed with it, so there was a considerable loss of butter where there were many patrons.

Next came the "oil test churn," in which after churning a small sample of cream the tube in which it was churned was placed in hot water and the butter melted and the liquid butter or oil was measured. This method was also cumbersome and inaccurate.

Shortly after the establishment of the experiment stations in the several States, the chemists of several of them set to work to find a chemical test for the quality of milk, a test which should be inexpensive, simple, and such that the average factory operator, unskilled in chemistry, could use it correctly.

The Patrick, Short and Bremling tests were the first fruits of this research by scientific men. These all had merit, but also had serious objections, requiring more or less complicated apparatus or methods. In 1888 Professor Babcock, of the Wisconsin Experiment Station, placed before the public the test which now bears his name into every progressive dairy in the United States.

In this test but one chemical reagent, i. e., sulphuric acid, is used, and the minimum amount and simplest kind of apparatus is required.

Good butter is fairly uniform in the proportion of butter fat, water, salt, casein, etc., it contains, the butter fat being between 85 per cent. and 86 per cent., while the other 14 per cent. or 13 per cent. consists of the water, mostly, a little salt, casein and other solids. This being true, any accurate measure of the butter fat in a sample of milk is a fair indication of the amount of butter which may be made from it, a means of accurately, simply, cheaply, ascertaining this is what Dr. Babcock has given to the world.

The apparatus required for making the test are bottles for holding the milk, a pipette holding 17.6cc. for accurately measuring a sample of milk, a cylindrical measure holding 17.5cc. of acid (commercial sulphuric) and a centrifuge for whirling the bottles.*

This apparatus is sold complete by all dealers in dairy supplies, and ranges in price from two or three dollars up, depending on number of bottles; five dollars will buy a good one.

The test is not a substitute for the churn or separator; it is simply a quick, accurate means of ascertaining how much butter fat the cow has put into a given quantity of milk, or how much has been left in the

*This talk was accompanied by the testing of several samples of milk. The several pieces of apparatus were shown to the audience and explained in detail.—Editor.

skim milk or buttermilk by the dairyman. Many of you have noticed that when milk is placed on the stove some globules of melted fat will float on the surface of the milk, but no amount of heat will melt and bring to the surface all the butter fat in that milk.

Dr. Babcock found that by the addition of 17.5cc. of acid to 17.6cc. of milk the chemical action is such that the fat was readily separated by whirling the bottles in the centrifuge for five minutes, then fill the bottle up to the neck with water nearly boiling hot and whirl for one minute and fill to within one inch of the top and whirl again for one minute. All the fat in that sample of milk will now be found in the neck of the bottle, and can be measured by the scale on it. This scale is graduated to show what per cent. of the whole milk is fat. One unit on the scale therefore represents one pound of fat in 100 pounds of milk.

It is essential that the sample taken fairly represent the whole milk. This may be secured by pouring the milk from one vessel to another two or three times. If the milk has stood and the cream has become so thick or dry that it can not be thoroughly mixed with the milk it is impossible to get a fair sample, and the test of an unfair sample is worthless.

In nearly every herd of dairy cows, their value depends on the value of the butter fat they produce, over and above the cost of food. In many herds of six or more cows there is one or more that does not produce butter fat enough to pay for the feed she eats. For example, a cow makes 5,000 pounds of milk testing 3 per cent., equals 150 pounds of fat. An average price at the creamery would be 18 cents per pound, or \$27 for the year's income from that cow. While the second one gives the same amount of milk, it tests 4 per cent. and will contain 200 pounds of butter fat, worth at the creamery \$36. With the cost of keeping a cow, \$30 or \$35, one of these cows is kept at a loss and part of the profit on some of the others must be used to pay the deficit. Better sell or even kill this unprofitable cow and save the feed and labor and make more clear profit on those that are left.

If a dairyman has a tester he should test the skim milk occasionally to see if he is getting all the butter fat out. The loss here may amount to considerable in the course of a year if the separator is a little out of order or runs too slow, or if insufficient ice has been put into the tank where the shot-gun cans are placed.

If a dairyman has six cows averaging 5,000 pounds of milk a year, and he loses only three-tenths of 1 per cent. more butter fat in the skim milk than he needs to if his separator is run right or the water in his creamer is cold enough, the loss would amount to seventy-five pounds of fat or eighty-seven pounds of butter, which should bring him twenty cents per pound; but say fifteen cents per pound is all he can get; then the loss would be \$13.05. Add to this the loss in dollars, on the unprofitable cow, and we see one of the large leaks on many dairy farms. Would it not be

a profitable investment to put \$5 into a tester that will show where this leak in the dairy is? If, perchance, there are more than one unprofitable cow, it is all the more desirable to know it.

The progressive creameries nearly all use the test as a basis for paying for the milk. It is manifestly unfair that the man who only brings three pounds of fat in 100 pounds of milk should receive for it the same price as does his neighbor who brings four pounds of butter fat in his 100 pounds of milk.

Last year Dr. Van Slyke showed us (pp. 107-9, 9th Report Ind. Dairy Assoc.) that milk which contained the highest per cent. of fat was also most valuable for the manufacture of cheese, and that the test is an equitable method of paying for milk at the cheese factory as well as the creamery.

The steam gauge on the boiler does not do any work, or take the place of the engine, or whistle; it just shows the engineer how much steam is on hand for him to use, and the more skillful he is and the better order his machinery is in, the more work he can get done with that amount of steam.

So the Babcock test is to the creamery man or the dairyman simply an accurate indicator or measure of how much butter fat a given quantity of milk contains for him to take out and make into butter, or how much he has failed to get out of the skim milk or buttermilk.

DISCUSSION.

Mr. Drischel: The test business is a thing that dairy farmers should study up.

Mr. Van Norman: The test is valuable because it shows what we are doing in our work. It is the farmer's fault if he does not get the butter fat out of the milk. The other day Mr. Drischel was showing me his book, and looking down the page I saw this number, 1,019 pounds; that was the amount of milk some one patron delivered to his factory in June. The test was 3.9. Running down a little further I saw another 1,019. I said to Mr. Drischel, "Do you know how many cows the man had who brought in the 1,019 pounds?" He consulted his man and found three cows. But the other man had one cow only. According to the price Mr. Drischel was paying for that milk he paid the first man for 1,019 pounds \$6.72. The next man for the same amount of milk, \$7.13, a difference of forty-one cents. What does it cost to keep a cow a year?

Mr. Woods: Thirty-five dollars.

Mr. Billingsley: From \$35 to \$40.

Mr. Van Norman: I call it \$27. I put it low. At that rate it would cost him \$2.25 to keep each cow one month. The first cow produced an

income of \$7.13 for the month, and it cost the owner \$2.25 to produce that milk, therefore he had a profit of \$4.88. It is generally figured in dairy figuring that the manure pays for the labor. So he had that much to pay him for his investment. The man that had three cows received \$6.72, his cows probably cost as much to feed as the others. The probability is he did not feed them quite as heavy. The three cows cost \$6.75, and he only got \$6.72. A loss of three cents. He had all his labor for nothing. There are many herds where another condition of affairs exists. We will take Mr. Woods's figures. If it costs \$35 a head to keep a cow a year, what is a fair return? I believe Mr. Benjamin said yesterday morning \$60 is a fair income from a cow.

Mr. Woods: That is a fair income.

Mr. Van Norman: Suppose a farmer has four or five cows, and will say No. 1 eats up \$30 worth of feed, and makes \$60 worth of milk or butter; that would give \$30 profit.

	<i>Feed Eaten.</i>	<i>Value of Product.</i>	<i>Profit.</i>	<i>Loss.</i>
No. 1	\$30 00	\$60 00	\$30 00	..
No. 2	30 00	50 00	20 00	..
No. 3	30 00	40 00	10 00	..
No. 4	30 00	30 00	. . .	..
No. 5	30 00	29 00	. . .	\$1 00
Profit			\$60 00	
Loss			1 00	
Net profit on five cows			\$59 00	

Kill or sell Nos. 4 and 5, and the first three will make a net profit of \$60, and save the labor of caring for two cows for nothing.

Mr. Drennen: Is the tester coming into general use among the dairy-men individually?

Mr. Van Norman: Yes, I think it is.

Mr. Drennen: I mean among the farmers, the dairymen themselves.

Mr. Van Norman: Well, the creameries have largely adopted it—I think very largely—and the farmers are coming to it.

Mr. Drennen: Does the average dairyman see for himself the utility of the tester?

Mr. Van Norman: I think many farmers do; I can't say that most of them do.

Mr. Woods: I think about one in a thousand.

Mr. Van Norman: I think a great many more than that. I would put it at 200 or 300 in a thousand of those who keep five or six cows, or

more. I do not think the average farmer keeps more than two to four cows. When you talk of the average farmer, I take it that is a farmer who has six or more cows, and I believe that perhaps 300 of every thousand realize the value of it, and many of them have the tester, and many realize the value of it and will get it just as soon as they think they can afford it, when in reality they can afford it right away.

A Member: Why is it milk varies so much as it does one day with another? It will vary from two to six-tenths in a month. I ask the reason for that.

Mr. Van Norman: The relation of fat to milk is what Dr. Van Slyke called last year one of the unsolved problems of dairying. We do not know why, absolutely, but we know that a cow will vary from day to day. It is sometimes due to fright and unkind handling. If you take a cow that is ordinarily quiet and run a needle into her, or hit her with a club, or disturb her tranquillity in some other way, the yield of milk will be very much less for that milking. If she has what is called a nervous temperament, and is a very sensitive cow, there will be a very marked difference in the yield of milk, and fat will not be produced nearly so much. For instance, she may give to-day a pound and a half of fat in forty pounds of milk. You abuse her to-morrow and she may give only twenty-five pounds of milk, but she will only fall off a quarter of a pound in fat. In other words, the variation in the yield of milk is greater than the variation in the yield of fat. I remember the figures of one herd in which one cow only varied four-tenths of a per cent. in a whole year, while another varied as much as 3 per cent. in her yield with no apparent cause. We have at Purdue a cow that shows a very marked variation in the yield of fat and of milk, and we have been studying to learn the cause. It may be some particular trouble with the feed, but we do not know. It may be some particular condition of the weather. Sometimes we ourselves do not feel so good as we do on other days. So of the cow. She may be a very sensitive cow and the milker may be a little rougher on some days than on others, and that may have some influence. A multitude of influences are at work. The best dairyman is the one who understands the largest number of them. The tester under ordinary conditions is to be relied on for accuracy. That variation is not a variation of the tester, but a variation in the cow.

Mr. Woods: If Mr. Van Norman is correct in his statement I have been laboring under a wrong impression. He says that in disturbing the cow she will give less milk, but not much less fat. That is, the effect of this disturbing of the cow is more noticeable in the quantity of milk than in the amount of fat for the day.

Mr. Van Norman: In a general way, that is true.

Mr. Woods: I always understood the difference was more noticeable in the diminished amount of fat than in the quantity of milk. Governor Hoard said when at Centreville, if I am not mistaken, that it was more noticeable in the amount of fat.

Mr. Van Norman: I think the larger number of cases will show that the fat is least variable.

Mr. Woods: I would like the opinion of the Chairman on that.

President Billingsley: I don't know.

Mr. Woods: And I don't know.

Professor Plumb: I think Mr. Van Norman's position is correct in that.

Mr. Woods: I am quite sure Hoard teaches differently. I don't know anything about it.

The following resolutions were adopted:

Whereas, The Indiana State Dairy Association, in convention assembled, learns with great regret that the Hon. George W. Steele, of Marion, representing Indiana in the United States Congress, approves of the use of oleomargarine in the Soldiers' and Sailors' Homes and Orphans' Homes; be it

Resolved, That this Association emphatically disapproves of such attitude on the part of its State Representative, and deplores the fact that any one of our members of Congress should favor supplying the wards of the nation, the veterans and widows and sons and daughters of veterans, with a class of food sold in the open markets under fraudulent representations, and in direct opposition to the sale of honest dairy goods; and be it further

Resolved, That the Secretary hereby be directed to forward a copy of these resolutions to the Hon. G. W. Steele, and to each other Congressman from Indiana in the United States Congress.

Professor Plumb: Eighty-seven million pounds of oleomargarine were made in the United States last year. The National Dairy Union is so exercised over this question they have had two representatives come down into this State from Minnesota in order to see what is possible to be done to get the dairymen of Indiana enrolled in favor of honest butter. Every dairyman believes, of course, that this compound should only be sold on its merits, but that is not what is done. A representative of the National Dairy Union called at Mr. Steele's home at Marion, and Mr. Steele was very curt in his treatment of this gentleman and told him he was in favor

of the use of oleomargarine in the government homes, and that would imply that he is in favor of the use of oleomargarine in all public institutions. He admitted that he did not use it in his family because he could buy good butter, that he bought butter of a person who made it regularly and supplied him at a certain price, and it was entirely satisfactory, and he did not care to use oleomargarine, but he thought it was good enough for public institutions. I do not think this Association can speak too emphatically in relation to this matter, because it does concern the welfare of the dairy interests in the highest degree. I am sorry this matter could not have been brought up sooner, and I had thought of offering a motion that the President appoint a committee of ten, composed of persons who live in the vicinity of Mr. Steele's home at Marion, who could visit him personally and have a talk with him, and find out if his view's can not be changed, and if they could not meet him personally at his home to have correspondence with him.

CHEESE MAKING ON THE FARM.

ANNA M. HULL, ROWLAND, ALA.

Having been requested to write a paper on this subject for use on this occasion, I submit what seems to me worthy of consideration, briefly.

Cheese making can be carried on on the farm as successfully as anywhere, and even more so. It is well for the farmer to increase his dairying by the addition of this, or by its substitution for butter making. Butter sometimes becomes too cheap to be profitable, unless you have year-round engagements at a fixed price. Then butter spoils by becoming too old, especially in the season when we make most of it. On the other hand, cheese improves by age, when properly taken care of. A few people like cheese two or three weeks old, others four to eight weeks old, and still others like it six months old or more.

One can, by making a good article, create a market of his own around home, even in the country, and in towns near by. Here you can get a better price for your cheese than the factory product sells for at a distance. Then the whey, fed, while sweet, to calves and pigs, is a source of profit.

As to the matter of time, cheese making compares favorably with butter making. It may perhaps take a little more time for the former, but not if the butter must be delivered to customers a certain day of every week, regardless of weather or other work on the farm.

There is one general direction concerning the making of cheese to be observed, namely, be very particular about everything, and do everything

at the proper time. It is not advisable for the slipshod farmer and careless housekeeper to go into the business. Everything must be done just right from first to last. The milk must be brought to the vat uncorrupted by any foreign matter, the vessels perfectly clean, and all things done with the utmost carefulness according to the rules and directions laid down by experts in the business.

I cannot here tell the farmer's wife or daughter how to make the cheese. Suffice it to say, get a hoop and a half dozen followers for every fifty or seventy-five pounds of milk you have to make up daily; construct a press, using a carpenter's work-bench screw for power, and procure the little book "A B C of Cheese Making."

The Young America hoop is the best size for farm use. The book can be bought of Montgomery Ward & Co., of Chicago, for forty-four cents. This book is all the instructor I ever had in cheese making, and while two cheese factories in our vicinity and four men running them, who professed to know how to make cheese, have turned out about two tons of bad cheese, which had to be fed to hogs or sold for fish bait at two cents per pound, I have never made but two cheeses unfit for table use. One I forgot to salt, and the other failed because the press broke down.

At the present time all those men are out of the cheese business, and the factories are spoiling from disuse and neglect; while, as far as I know, no cheese is now made in the State of Alabama but at our house.

If farmers would see the "good time coming," so much heralded and so desirable, let them be wide awake and join in the general rush for the dollars.

President-Elect Benjamin: I assure you all that I consider it quite an honor to head the State Dairy Association for the year 1900, the eleventh annual session of this Association. It is the impression that that session will be held in the county of Lake. I shall do my utmost to make the meeting a success. It has been said in farmers' institutes, and places of that sort, that I have neglected my business to make the institutes a success, and I assure you no stone will be left unturned to make the meeting of this Association next year a success in every respect. I invite you all to be present and to bring all your friends. Lake County is the first county in the State in the production of milk. Lake County has been honored by having the Dairy Association meet there once during its history, and we propose to make the coming meeting a record breaker. At this late hour I shall not hold you any longer. Again, I thank you for the honor you have done me.

On motion of Mr. Drischel, the convention adjourned sine die.

REPORT TREASURER INDIANA STATE DAIRY ASSOCIATION.

Lafayette, Ind., December 7, 1899.

To the Officers and Members of the Indiana State Dairy Association:

I respectfully submit the following report as Treasurer:

STATE APPROPRIATION ACCOUNT.

Receipts.

1898-99.

Dec.	14.	Balance turned over by ex-Treasurer.....	\$0 93
"	14.	Auditor of State (drawn December 2, 1898).....	100 00
Jan.	3.	Auditor of State.....	200 00
Oct.	31.	Auditor of State.....	200 00
Total			<u>\$500 93</u>

Disbursements.

1898.

Nov.	21.	150 five-cent stamps, 100 one-cent stamps.....	\$8 50
Dec.	5.	Stamps	2 00
"	5.	Home Journal Printing Company, printing postal cards, programs, circular letter and box envelopes.....	13 50
"	9.	Express on box from Newark, N. J.....	70
"	9.	Telegrams Chicago and reply.....	65
"	10.	C. S. Plumb, expenses to Mooresville.....	6 65
"	15.	O. P. Macy, drayage on exhibits.....	95
"	15.	T. F. Gallagher, expenses Chicago as judge of butter and cheese	11 00
"	15.	Revenue stamps	50
"	15.	Postage stamps	2 00
"	15.	C. S. Plumb, Secretary-Treasurer, expenses annual meeting	5 90
"	15.	W. S. Commons, Executive Committee, expenses annual meeting	7 40
"	15.	H. E. Van Norman, Assistant Secretary, expenses annual meeting	4 95
"	17.	C. S. Plumb, salary per vote of Association (on account)	25 00
"	17.	Cash book	45

1899.

Jan.	3.	H. E. Van Norman, expenses to Indianapolis.....	4 45
"	5.	L. W. Thomas, second premium on butter and first on cheese	11 00
"	7.	H. Matthews, first premium on creamery butter.....	15 00
"	7.	Spiceland Creamery, second premium on creamery butter	10 00

"	7.	P. L. Johnson, third premium on creamery butter.....	5 00
"	7.	Mrs. Chas. Lamont, first premium on dairy butter.....	10 00
"	7.	A. Hoadley, third premium on dairy butter.....	4 00
"	7.	Boyd & Drischel, first premium on cheese.....	15 00
"	7.	W. L. McCain, third premium on cheese.....	5 00
"	7.	Prof. Emma M. McRae, expenses as lecturer.....	13 90
"	12.	Dr. L. L. Van Slyke, expenses as lecturer.....	68 30
Feb.	2.	Postage	3 00
"	23.	S. B. Woods, expenses account Executive Committee...	12 20
"	24.	Prof. W. J. Frazer, expenses as lecturer.....	10 25
Mar.	9.	A. O. Reser, stenographer's report.....	40 00
"	17.	Postage	2 00
"	23.	Express on reports.....	30
July 5-Sept. 12.		Postage, including mailing reports.....	14 05
Oct. 31.		W. Bent Wilson, printing annual report.....	166 80
Total			\$500 40
Balance to miscellaneous account.....			53
			<hr/> \$500 93

MISCELLANEOUS FUNDS.

Receipts.

1898.			
Dec. 13.		Balance turned over by ex-Treasurer.....	\$18 31
1899.			
Mar. 7.		300 copies Dr. Van Slyke's article.....	15 00
May 5.		C. S. Plumb, life membership.....	10 00
Mar. 6.		C. E. Buckley & Co.'s advertisement.....	3 00
July 17.		Gallagher Bros.' advertisement.....	5 00
"	22.	Polar Creamery's advertisement.....	5 00
"	24.	Genessee Salt Co.'s advertisement.....	10 00
"	24.	A. H. Barber Manufacturing Co.'s advertisement.....	5 00
Aug. 3.		O. Armleder Co.'s advertisement.....	5 00
"	5.	Cornish, Curtis & Green Manufacturing Co.'s advertise- ment	10 00
"	11.	De Laval Separator Co.'s advertisement.....	12 00
Nov. 3.		Union Business College's advertisement.....	5 00
"	17.	D. H. Burrill & Co.'s advertisement.....	10 00
Dec. 4.		Memberships to date.....	87 00
"	4.	Reports	60
"	4.	Balance from State appropriation.....	53
"	4.	43 badges sold at Mooresville meeting.....	10 75
"	7.	A. G. Elliot & Co., Philadelphia.....	10 00
Total receipts			<hr/> \$222 19

Disbursements.

1898.		
Dec. 13.	100 badges	\$20 00
1899.		
Jan. 3.	500 letter heads (Home Journal).....	2 00
" 3.	Express to Lansing	36
Feb. 27.	Express on package to Cambridge City.....	50
Apr. 8.	Circular letters, stenographer.....	5 00
May 5.	C. S. Plumb, on account salary.....	10 00
Apr. 8.	W. Bent Wilson, 400 copies Van Slyke's article.....	14 00
Aug. 18.	Stamps	50
Oct. 28.	Stamps	10
Jan. 7.	Hugh Nisbet, second premium on cheese.....	10 00
" 27.	Home Journal, 300 circular letters, box envelopes.....	3 00
July 10.	Stamps	1 00
Jan. 10.	C. S. Plumb, expenses before Ways and Means Committee	2 50
Mar. 10.	H. E. Van Norman, railroad fare to Chicago, account advertising	3 00
Oct. 31.	H. E. Van Norman, Indianapolis and return.....	2 65
" 31.	Messenger	15
Nov. 28.	Stamped envelopes and stamps.....	2 63
Dec. 5.	Home Journal Printing Co., 1,000 programs, \$4.00; 250 cards, \$1.50	5 50
Total disbursements		\$82 89
Cash on hand.....		139 30
		<hr/>
		\$222 19

We, the Auditing Committee, find the report of the Secretary and Treasurer correct.

C. S. PLUMB,
O. A. STUBBS,
S. B. WOODS.

Cambridge City, Ind., December 8, 1899.

CREAMERY BUTTER—ENTRIES AND SCORES, CAMBRIDGE CITY, DECEMBER 7-8, 1899.

N	NAME OF EXHIBITOR.	Address.	Flavor.	Grain.	Color.	Salt.	Pkg.	Total.
			50	25	10	10	5	100
1	Herbert Newby.	Spiceland	46½	24½	10	9½+	5	95½
2	Perry L. Johnson	Prairie Creek	47	24½	9½--	10	5	96
3	H. F. Rotterdam	Benos, Ill.	46	24½	9½+	10	5	95
4	O. J. Richardson	Lewisville.	43	24½	10	10	5	92½
5	Harry Matthews	Brunswick	44	24½	9--	10	4	91½
6	Williamsburg Creamery	Williamsburg	47	24½	10	9½+	5	96
7	Webster Creamery	Webster	46	24½	9	10	5	94½
8	Centerville Creamery	Centerville	45	24½	9½	10	5	94
9	B. F. Wilmore	Winchester	47½	24½	10	10	5	97
10	T. A. Shaffer	Hagerstown	49	24½	9½--	9½+	5	97½
11	Westfield Creamery	Westfield	45½	24½	9½--	10	5	95½

DAIRY BUTTER.

			Flavor.	Qual-ity.	Text-ure.	Color.	Salt.	Total.
			30	30	30	10	10	100
1	C. B. Benjamin	Leroy	48	24½	10	9½	6	97
2	Mrs. Chas. Lament	Joppe	46	25	10	9½--	5	95½

CHEESE.

No.	NAME.	Address.	Flavor.	Qual-ity.	Text-ure.	Color.	Salt.	Total.
			30	30	30	10	10	100
1	O. J. Richardson	Lewisville.	27	29	19	10	10	95
2	Boyd & Drischel	Cambridge City	27½	29	19	10	10	95½

1. Genesee Salt.
 2. Worcester Salt.
 3. Diamond Crystal Salt.
 4. Delavan Separator.
 5. Russian Separator.
 6. Harplem Separator.
 7. United States Separator.
 8. Reid Separator.
 9. Jumbo Separator.
 10. Wells-Richardson Butter Color.
 11. Buckeye Salt.
 12. B. and B. Salt.
 13. Ashton Salt.

+ Too much color or salt. -- Not enough color or salt.

PREMIUM AWARDS.

	<i>Points.</i>
Prize No. 1, best tub creamery butter, premium, \$15 cash, Hagerstown Creamery, Hagerstown	97¾
Prize No. 2, second best tub creamery butter, premium, \$8 cash, Winchester Creamery, Winchester.....	97
Prize No. 3, best five pounds dairy butter, premium, \$8 cash, C. B. Benjamin, Le Roy.....	97
Prize No. 4, second best five pounds dairy butter, premium, \$6 cash, Mrs. Chas. Lamont, Joppa.....	95½
Prize No. 5, best full cream cheese, premium, \$10 cash, Boyd & Drischel	95½
Prize No. 6, second best full cream cheese, premium, \$8 cash, O. J. Richardson	95
Wells and Richardson's special offer: To Hagerstown Creamery, solid gold medal; Winchester Creamery, \$10 cash; C. B. Benjamin, Le Roy, \$5 cash.	

APPENDIX.

BUTTER ENTRIES.

Indiana State Fair, September 18 to 23, 1899.

CREAMERY BUTTER—SIXTY-POUND TUB.

<i>No.</i>	<i>Winning Score.</i>
18. W. T. S. Bray, Westfield.	
151. Harry Larson, Dodgeville, Wis.	
181. Herbert Newby, Spiceland.....	97

DAIRY BUTTER—FIVE POUNDS IN PRINTS.

54. Mrs. E. T. Drake, Edinburg.	
31. Bettie Clove, Boyersville.	
101. Mrs. H. Garretson, Pendleton.	
168. Jno. Marvel, Royalton.	
227. Thos. Roberts, Carmel.	
231. Peter Raab, Brightwood.	
244. E. Saltmarsh & Co., Sunman.	
301. M. B. Walters, Greenwood.	
312. A. F. Ward, Thorntown.....	98

DAIRY BUTTER—FIFTEEN POUND PACKAGE.

60. Mrs. Jerome Dunlap, Lafayette.
 31. Mrs. Bettie Clove, Boyersville.
 231. Peter Raab, Brightwood..... 97
 238. Wm. J. Raab, Brightwood.
 240. A. B. Staidley, Carlinsville, Ill.
 244. E. Saltmarsh & Co., Sunman.
 1. Mrs. O. A. Sample, Greenfield.
 312. A. F. Ward, Thorntown.

DAIRY BUTTER, MADE BY GIRLS UNDER TWENTY.

22. Laura Brandon, Greenwood.
 102. Lula Garretson, Pendleton.
 245. Rose Spires, 2501 Station B, Indianapolis.

BUTTER BY GRADUATE OF ANY DAIRY SCHOOL.

63. Joseph Echterling, Dyer.

FULL CREAM CHEESE.

	Score.
First, W. L. McCain, Hortonsville.....	93
Second, Boyd & Drischel, Cambridge City.....	88
Third, Groveland Cheese Co., Dana, Ill.....	85

CHEESE—YOUNG AMERICAS.

Boyd & Drischel, Cambridge City.....	92½
--------------------------------------	-----

INDIANA ENTRIES AND SCORES NATIONAL CREAMERY BUTTER MAKERS' CONVENTION, LINCOLN,
NEBRASKA, FEBRUARY 19-23, 1900.

No.	NAME AND ADDRESS.	Aver- age.	Flavor.	Grain.	Color.	Salt.	Pkg.	Brand of Salt.	Brand of Color.	Style of Separator.	Style of Churn.
162	Perry L. Johnson, Prairie Creek	93	36 38 38½	25 25 24½	15 15 15	10 10 10	5 5 5	Genesee.	W. & R.	Tabular.	Box.
64	T. F. Fibrod, North Liberty.	92	36 38 37½	25 25 25	14 14 14	10 10 10	5 5 5	Worcester.	W. & R.	Alpha.	Box.
300	Sitas Holloway, North Manchester . . .	92	37 37 37	25 25 25	15 15 15	10 10 10	5 5 5	Genesee.	W. & R.	Jumbo.	Box.
200	J. W. Rohs, Centerville	91	37 37 37	25 25 25	14 14 14	10 10 10	5 5 5	Worcester.	W. & R.	Reid.	Box.
5	C. W. Lisman, Carlisle	89.67	36 37 37	25 25 24	14 14 13	10 10 10	5 5 5	Diamond Crystal.	W. & R.	Russian.	Box.
56	Frank Lennich, Hanna	89	34 34½ 35	25 25 25	15 15 15	9½ 9½ 9½	5 5 5	Worcester.	Thatcher.	Alpha.	Box.
83	W. B. Hastings, Sullivan	87	34 33 33	24½ 25 25	14½ 15 15	9 9 9	5 5 5	Genesee.	W. & R.	Alpha.	Box.
68	C. E. Walderman, Bremen.	87	33½ 33 33	25 25 25	14 14½ 14½	9½ 9½ 9½	5 5 5	Worcester.	W. & R.	Alpha.	Box.
2	Ludwig Engelman, Laporte	86.67	35 35 36	23½ 24 24	13 14 13	9½ 9 9	5 5 5	Genesee.	W. & R.	Reid.	Disbrow.

INDIANA ENTRIES AND SCORES—Continued.

Number	NAME AND ADDRESS.	Aver- age.	Flavor.	Grain.	Color.	Salt.	Pkg.	Brand of Salt.	Brand of Color.	Style of Separator.	Style of Churn.
396	H. Newby, Spiceland	86	31 31 31	25	15	10	5	Worcester.	W. & R.	Sharpless.	Box.
288	C. Harris, Webster.	85.5	34 33 33½	24 24 24	14 14 14	9 9 9	5 5 5	Worcester.	W. & R.	Alpha.	Disbrow.
287	L. B. Harris, Williamsburg	84.5	31 31 31	24½ 24 24½	14 14 14	10 10 10	5 5 5	Worcester.	W. & R.	Alpha.	Box.
100	O. R. Working, Hagerstown.	84.5	30½ 31 30	25 25 25	14 14 14	10 10 10	5 5 5	Worcester.	W. & R.	U. S.	Box.
163	I. M. Kellog, Dana	84.5	30 30 30½	25 25 25	14½ 14 14½	10 10 10	5 5 5	Genessee.	W. & R.	Alpha.	Disbrow.
3	Eli C. Reese, Lynn	84.17	32 33 33	24 25 25½	13 13 13	10 10 10	5 5 5	Diamond Crystal.	W. & R.	Reid.	
558	Geo. Starbuck, Winchester	84	30 30 30	25 25 25	14 14 14	10 10 10	5 5 5	B. & B.	W. & R.	Alpha.	Box.

STATE AVERAGES.

	<i>Entire Average Score.</i>
Illinois	90.52
Minnesota	90.17
Iowa	89.65
Nebraska	80.07
Wisconsin	87.60
Indiana	87.59
Kansas	86.67
South Dakota	85.86

To the highest scorer in each State having twenty or more entries a silver cup was awarded as a State prize. Indiana lacked just four tubs of winning one of these cups, though her average was higher than some which did receive one.

AMERICAN DAIRY JOURNALS.

The publishers of these journals will not doubt gladly send copies to those who may apply for them.

American Cheese Maker, Grand Rapids, Mich. Monthly.

American Dairyman, New York City, N. Y. Weekly.

Chicago Produce, Chicago, Ill. Weekly.

Creamery Gazette, Des Moines, Iowa. Monthly.

Creamery Journal, Waterloo, Iowa. Monthly.

Dairy and Creamery, Chicago, Ill. Semi-monthly.

Dairy World, Chicago, Ill. Monthly.

Elgin Dairy Report, Elgin, Ill. Weekly.

Hoard's Dairyman, Fort Atkinson, Wis. Weekly.

Jersey Bulletin and Dairy Farmer, Indianapolis, Ind. Weekly.

Milk News, Chicago, Ill. Semi-monthly.

New York Produce Review and American Creamery, New York City. Weekly.

Practical Dairyman, Indianapolis, Ind. Monthly.

St. Paul Dairy Reporter, St. Paul, Minn. Weekly.

Note.—The National oleomargarine and the filled cheese laws are printed in full in the 1897 Report of the Dairy Association. The Indiana pure food law is printed in the 1898 Report of the Dairy Association.

PROCEEDINGS
OF THE
Indiana Horticultural Society,

HELD AT
INDIANAPOLIS, INDIANA, JANUARY 3 AND 4,
1900.

PROGRAM FOR THE MEETING.

WEDNESDAY, JANUARY 3, 1900, 1:30 P. M.

President's Address.....C. M. Hobbs, Bridgeport.
Reports of Secretary and Treasurer.
Reports of Vice-Presidents.
Report of Committee on Experimental Orchard.
Report of Superintendent of Experimental Orchard.
Joe A. Burton, Orleans.
General discussion of reports.
Appointment of Committees.

WEDNESDAY EVENING, 7:30.

Paper—"Crossing and Hybridizing"Fred Dorner, Lafayette.
Discussion.
Paper—"Essentials to Successful Orchardng."
W. F. DeVilbiss, Ft. Wayne.
Discussion led by L. D. Creel, Angola.
General discussion relating to Life Memberships in the Society.

THURSDAY MORNING, 9:00.

"Is the Carolina Poplar a Desirable Tree for Street Planting?"
Discussion led by W. B. Flick, Lawrence.
J. J. Hollowell, Noblesville.
Paper—"A Plea for a More Complete Organization of Horticulturists."
J. C. Kimmell, Ligonier.
Discussion led by Cal Husselman, Auburn.
Paper—"The Local Horticultural Society's Program."
J. C. Grossman, Wolcottville.
Discussion led by Miss Lucretia Hobart, Indianapolis.

THURSDAY AFTERNOON, 1:30.

Paper—"The Value of Horticulture to Our Public Institutions."

Prof. A. W. Butler, Indianapolis.

Discussion led by Prof. T. J. Charlton, Plainfield.

Dr. S. E. Smith, Richmond.

Supt. Alex. Johnson, Ft. Wayne.

Paper—"What Can We Do Toward Creating a Better Sentiment Concerning the Improvement of Our Rural School Grounds?"

Supt. Lawrence Turnan, Anderson.

Paper—"Some Desirable Trees for Planting in School Grounds."

J. P. Brown, Connersville.

General Discussion.

THURSDAY EVENING, 7:30.

Election of Officers.

Paper—"Some of the Essentials to Successful Fruit Growing."

R. Morrill, Benton Harbor, Mich.

Discussion.

FRIDAY MORNING, 9:00.

Paper—"The Apple—Its Origin and Development."

John Morgan, Plainfield.

Discussion led by John Tilson, Franklin.

Report of Delegate to American Pomological Society.

W. H. Ragan, Greencastle.

Report of Committees.

Adjournment.

C. M. Hobbs, Bridgeport,

President.

J. Troop, Lafayette,

Secretary.

PRESIDENT'S ADDRESS.

C. M. HOBBS, BRIDGEPORT.

It is with pleasure I greet the members of the Indiana Horticultural Society in this our thirty-ninth annual meeting. During all these years this Society, with its limited means and facilities, has done what it could in the dissemination of horticultural knowledge and the promotion of the horticultural interests of the State. Being purely educational in its character, it has never promoted private or business interests, and it is to be hoped it never may.

At our annual and summer meetings, we have had papers and discussions upon the scientific and practical aspects of horticulture in the fullest meaning of that term. The propagation and growing of trees and plants, the cultivation and marketing of fruits, forestry, landscape gardening, floriculture, vegetable gardening, practical entomology, botany, ornithology, geology and chemistry—all these subjects have been presented and discussed by persons of scholarship and experience, and these discussions have appeared from year to year in our printed reports, making a valuable reference library on horticultural subjects. These meetings and reports have been of vast benefit to the horticultural interests of the State, and more especially to the beginner and the inexperienced.

This Society has encouraged the organization of county or local horticultural societies throughout the State. These societies have done much to promote horticultural interests in the locality where the meetings are held. There are now 18 or 20 such societies in the State. The State Society has encouraged the growing of better fruits, flowers and vegetables by offering premiums at its annual and summer meetings, and at the State Fair, to the exhibitors of the best specimens of these products.

As in all other lines of education, it is necessary that those who are capable and see the importance of accurate knowledge and thorough preparation should constantly press the importance of this upon the people; the experienced must lead the inexperienced. Out of more than 100 million fruit trees planted annually in the United States, probably not more than ten per cent. ever come into successful fruiting. This is too great a loss of time and money, and shows the necessity of improvement in our methods of planting and caring for trees.

With impoverished soils, and greater extremes of climate, caused largely by the destruction of our forests, with insect foes and fungous diseases brought from every quarter of the globe, and the competition of the world's markets, it is absolutely necessary to success that the agriculturist and the horticulturist be thoroughly informed, and that he be able to bring to his assistance all the aid that modern science, investigation and experience can give him.

As a basis for this preparation, we must start with the children in the public schools. Eighty-five per cent. of the children who attend the common schools never get farther than that in a school education; forty to fifty per cent. of these children remain on the farm or in the country. Is it not then a most reasonable demand that the children in our public schools should be taught those things that are of most interest to them, and that are to be the most useful in after life?

The plea is sometimes made that all pupils in the school have not a taste for these studies; that many will go into the trades and professions for their life work, and this line of study will be of little use to them. All children are not equally interested in mathematics, but it is taught to all alike for its practical use and as a mental discipline. .

There is no better all-round thorough means of full, well rounded mental development than nature study affords. If observing accurately, recording correctly in the mind, comparing, grouping and inferring justly, and expressing cogently, are the foundation for a symmetrical and proper development of the reasoning powers, is there a better field for the exercise of these faculties than nature offers? I feel that it would have been much better for me, and would be much better for my children, to know more about themselves and the many important and interesting things that are all about them, and with which they constantly have to do. It is vastly more important that they should know these things, if they have to give up some mathematics and some of the islands of the sea.

Every American citizen should own a home, and a home is not worthy of the name without its trees, shrubs, vines, fruits and flowers. So horticulture appeals to every man, woman and child in a greater or less degree. I hope this Society and each individual member will press this matter home upon the educational authorities until the study of nature in the common schools of the State shall be an accomplished fact. Other States see the importance of this work and are moving out along this line.

New York State has an experienced teacher in nature study, whose business it is to attend teachers' institutes and give special instruction as to the best methods of teaching and illustrating nature study. Our State should do as much.

In connection with this subject we must see to it that we have better school buildings and grounds. Instead of the bare, muddy yard and uninviting surroundings, let us have at least some good lawn, ample shade, and a few flower beds, where the children may be interested and instructed and may assist in beautifying the school yard. We have scarcely made a beginning in this line of work in our State; much needs to be done.

It is gratifying to know that our State is beginning to recognize the importance of the subject of forestry. The last legislature gave us some helpful legislation, and a State Forestry Association has been formed. We hope this is the foundation for some active work in this very much neglected yet important field.

We are pleased to be able to state that through the legislative committee of this Society, we were able to secure from the last legislature a law which will greatly assist us in preventing the introduction and spread of injurious insects and fungous diseases, and providing for the appointment of a State Entomologist to see that the law is enforced. The past year's experience has proven that the law, when generally enforced, will be of great benefit to the horticultural interests of the State.

We are sorry to have to state that the last legislature failed to make our regular annual appropriation of \$1,000. The principal reason given for this was that we had too large a surplus on hands. This unusual

surplus occurred by our funds getting temporarily tied up so that they were not available, but came in in time to appear in our annual report as surplus on hands.

We can not anticipate what the next General Assembly may do for us, but it is certainly a short-sighted policy in State legislation to fail to encourage the development of the productive resources of the State. Considered as an investment or business proposition, it pays in the increased taxable wealth of the State. The constitution of the State recognizes the importance of agricultural education and provides for the same. Our State has done and is doing something in this line, but certainly not as much as the importance of the subject demands.

Neighboring and many other States have been more generous toward horticulture, and as a result the horticultural interests of those States have been developed to a much greater degree than in our State.

Illinois appropriates annually for horticulture.....	\$4,000
Prints 2,000 copies of reports.	
Michigan appropriates	1,500
Prints 4,000 copies of reports.	
Missouri appropriates	2,500
Minnesota appropriates	1,000
Iowa appropriates	2,500
Prints 5,000 copies of reports.	
Wisconsin appropriates	1,500
Prints 800 copies of reports.	
Ohio appropriates	1,000

New York appropriated a few years ago \$15,000 annually for horticultural purposes, to be used in one judicial district in the apple section of the State. This work enlarged until it covered the whole field of agriculture and embraced the entire State.

I wrote Prof. Bailey, of Cornell University, to know just how much the State was now appropriating for horticultural purposes, and as to the scope of the work in that State. The following is his reply:

"Ithaca, N. Y., December 20, 1899.

"The State of New York makes an appropriation of \$55,000 a year for the purpose of carrying on extension work in agriculture. Only a fraction of this is used for horticultural work. The fund is divided approximately into halves, one-half of it being used for carrying on experiments all over the State, and the other half for carrying on nature study work in the schools and reading courses amongst the farmers. In the experimental work, the horticultural department has the disbursement of a part of the funds, but I suppose not more than three or four thousand of the whole fund can be said to be devoted to horticultural purposes

alone. We are of the opinion that this extension work is the most important work which the agricultural college has ever done. The fund was originally given for horticultural work alone, but gradually increased in importance until it now covers all agricultural industries. It is an appropriation for which we do not ask, but which the legislature seems to be glad to give."

Too much depends upon the prosecution of this work for our State to drop the work here. This Society has established an experimental orchard in a favorable location where it hopes to test the comparative merits of fruits, and give the results without bias to the public. It is the purpose of those in charge to give special attention to the origination of new varieties by cross fertilization, and to test all promising new varieties that may come to notice elsewhere.

Many valuable varieties of fruits have originated in this State, and have been extensively grown throughout the country. The Gregg raspberry, Taylor and Snyder blackberry have proven very valuable over a great extent of country and in a diversity of soil and climate. This Society should make a record of all the valuable fruits originating in the State, by whom and where originated, with a general description of the variety. This will bring proper credit to the State and place their history on authentic grounds for the future.

Our State possesses a great variety of soils, climate and topographical features. All classes of fruits and varieties do not succeed equally well in all parts of the State. We have, for instance, the lake region on the north, where the climatic conditions are perceptibly affected by the presence of these large bodies of water; we have the Ohio River section; the knob or hill section extending from the Ohio northward and terminating in Morgan County; and the prairie section of the northwestern portion of the State.

I think this Society would do the horticultural interests of the State great service in preparing a map of the State, defining these well marked sections, and indicating, as far as can be, the classes of trees and fruits best suited to each section.

I have not the time nor the inclination to discuss fully the subjects presented here, but believe them of sufficient importance to claim the careful consideration of this Society. I trust this thirty-ninth annual meeting will be the most interesting and profitable in our history.

REPORT OF THE SECRETARY.

FINANCIAL STATEMENT.

The following is a statement of the financial transactions for the fiscal year ending October 31, 1899. With this is submitted a list of vouchers and a summary of all moneys collected and paid into the hands of the

Treasurer, with warrants drawn on that officer for the corresponding period:

Summary of the Receipts for the Year Ending October 31, 1899.

Received for membership fees.....	\$87 50
Received from the Treasurer for office expenses.....	50 00
	<hr/>
Total receipts.....	\$137 50

Summary of Credits.

Balance due from last year.....	\$2 97
Paid for stationery and printing.....	30 90
Paid for freight and express.....	10 11
Paid for postage and postal cards.....	54 30
Paid for traveling expenses.....	24 05
Paid for telegrams.....	78
Paid for tree protectors for experimental orchard.....	2 00
Balance due the Society.....	12 39
	<hr/>
Total	\$137 50

Account with the Treasurer.

To balance on hand November 1, 1898.....	\$1,584 54
To State appropriation from State Treasurer.....	1,000 00
To cash received from the Secretary as membership fees.....	87 50
	<hr/>
Total	\$2,652 04
He has paid warrants 284 to 331, inclusive.....	1,486 94
	<hr/>
Balance in the treasury November 1, 1899.....	\$1,165 10

Following is a list of warrants drawn on the Treasurer for the fiscal year ending October 31, 1899:

1898.

December 8, Warrant No. 284, S. Johnson, Treasurer, to pay premiums at annual meeting.....	\$51 50
December 8, Warrant No. 285, W. R. Lazenby, expenses at annual meeting.....	14 80
December 8, Warrant No. 286, Mary Teas, services as Entry Clerk	5 00
December 8, Warrant No. 287, Mrs. H. M. Dunlap, expenses at annual meeting	12 25
December 8, Warrant No. 288, J. A. Burton, expenses at Board meeting	10 00

December 8, Warrant No. 289, J. Troop, Secretary, expenses at Board meeting	12 00
December 8, Warrant No. 290, Flora Chizum, stenographer.....	20 00
December 8, Warrant No. 291, Snead Thomas, expenses at Board meeting.....	7 60
December 8, Warrant No. 292, J. C. Stevens, expenses at Board meeting	10 60
December 8, Warrant No. 293, G. F. Newton, expenses at Board meeting	13 00
December 8, Warrant No. 294, E. Y. Teas, expenses at Board meeting	2 00
December 8, Warrant No. 295, C. M. Hobbs, expenses as President	14 00
December 8, Warrant No. 296, L. B. Custer, expenses at Board meeting	6 50
December 8, Warrant No. 297, C. M. Hobbs, expenses as committee at Orleans.....	6 50
December 8, Warrant No. 298, W. W. Stevens, expenses as committee at Orleans.....	1 50
December 8, Warrant No. 299, J. Troop, expenses as committee at Orleans	4 50
December 8, Warrant No. 300, L. B. Custer, expenses as committee at Orleans.....	11 50
December 8, Warrant No. 301, W. H. Ragan, expenses as delegate	18 00
December 8, Warrant No. 302, John Craig, expenses at annual meeting	43 00
December 8, Warrant No. 303, S. Johnson, expenses as Treasurer	10 00
1899.	
January 25, Warrant No. 304, J. Troop, Secretary, part of salary.	100 00
February 6, Warrant No. 305, C. M. Hobbs, to pay for land for experimental orchard.....	600 00
February 22, Warrant No. 306, J. Troop, Secretary, office expenses	50 00
March 4, Warrant No. 307, S. Johnson, Treasurer, to pay expenses Executive Committee meeting.....	12 20
March 4, Warrant No. 308, S. Johnson, delegate to Illinois meeting and other expenses of Legislative Committee.....	18 00
March 15, Warrant No. 309, M. G. Huey, premium omitted at annual meeting	1 25
April 19, Warrant No. 310, Wm. B. Burford, wrapping and labeling 600 reports.....	2 50
August 10, Warrant No. 311, canceled.	

August 10, Warrant No. 312, Albertson & Hobbs, trees for experimental orchard.....	16 80
August 10, Warrant No. 313, C. M. Hobbs, expenses at summer meeting	4 50
August 10, Warrant No. 314, S. Johnson, Treasurer, expenses at summer meeting.....	5 50
August 10, Warrant No. 315, G. F. Newton, expenses at summer meeting	5 00
August 10, Warrant No. 316, S. Johnson, Treasurer, for premiums at summer meeting.....	28 50
August 10, Warrant No. 317, J. A. Burton, expenses as Superintendent of experimental orchard.....	6 80
August 10, Warrant No. 318, Snead Thomas, expenses at summer meeting	5 35
August 10, Warrant No. 319, J. C. Stevens, expenses at summer meeting	9 70
August 10, Warrant No. 320, E. Y. Teas, expenses at summer meeting	4 20
August 10, Warrant No. 321, J. A. Burton, expenses at summer meeting	8 90
August 10, Warrant No. 322, Miss Flora Chizum, stenographer..	15 00
August 10, Warrant No. 323, C. R. Barns, expenses and services at summer meeting.....	26 30
August 10, Warrant No. 324, Stanley Coulter, expenses and services at summer meeting.....	6 00
August 10, Warrant No. 325, J. C. Power, expenses and services at summer meeting.....	13 50
August 10, Warrant No. 326, Mrs. V. C. Merideth, expenses and services at summer meeting.....	14 70
August 10, Warrant No. 327, J. Troop, Secretary, expenses at summer meeting	50
August 10, Warrant No. 328, J. Troop, part of salary.....	150 00
August 10, Warrant No. 329, C. M. Hobbs, expenses as President of Board.....	6 50
August 10, Warrant No. 330, Mrs. W. W. Stevens, expenses at summer meeting	13 50
October 31, Warrant No. 331, J. Troop, Secretary, office expenses.	87 50
Total	\$1,486 94

TREASURER'S ANNUAL REPORT.

Irvington, Ind., January 3, 1900.

Report of the Treasurer of the Indiana Horticultural Society for the fiscal year ending October 31, 1899:

Debits.

1898.

October 31. Balance in the treasury at last report.....\$1,564 54
 November 23. Received from State Treasurer..... 1,000 00

1899.

October 31. Received from Secretary Troop, membership fees.. 87 50

Total receipts\$2,652 04

Credits.

1899.

October 31. Paid on Warrants Nos. 284 to 331, inclusive, except-
 ing No. 311, which was canceled.....\$1,486 94

Balance in treasury.....\$1,165 10

Respectfully submitted,

SYLVESTER JOHNSON, Treasurer.

These reports were referred to the Finance Committee.

Reports from the Vice-Presidents were then read as follows:

VICE-PRESIDENT'S REPORT—FIRST DISTRICT.

 MRS. W. W. STEVENS, SALEM.

The report of the Vice-President from the Southern District will of necessity be quite brief. There is rarely a year when our fruit interests have paid so small a dividend. The summer and fall of 1898 was so very dry in this section that but a very poor stand of strawberries was obtained. This alone was serious enough to cut the berry crop of 1899 short, but to this was added late frosts and a drouthy fruiting season, making strawberries a losing rather than a paying crop.

Raspberries and blackberries were almost a total failure through being winter killed. In fact, many fine plantations were plowed up, and in many

instances not reset for the coming year. This will insure good local demand should the coming season be a fruitful one.

Currants and gooseberries have not paid the rent on the ground they have occupied for several years and from present indications they will be exterminated, root and branch. This is surely due to the climatic or soil condition. The bushes grow nicely, the insect pests can be easily subdued, but in spite of all, each year adds but one more to the entire failure of these crops.

Grape vines were killed back badly, gave no fruit at all and in many instances were so badly damaged as to promise little for the coming crop.

Peaches were most conspicuous for their absence, which fact is not the worst one. There will be no peaches to speak of in this district until new orchards begin to bear, if our "wiseacres" are right in their conclusions. I have heard of no enthusiast who is doing very much toward peach orcharding.

Plums and cherries were almost an entire failure. Occasionally there were a few trees in favorable locations that bore fruit, but not of any importance to the market.

There were about enough apples to make us wish there were none at all, to remind us of what "might have been." The few gnarly specimens did not keep well and any apples seen in Southern Indiana are far, far from home and look lonely and homesick.

REPORT OF VICE-PRESIDENT—SECOND DISTRICT.

JOE. A. BURTON, ORLEANS.

The past year was noted for extreme cold weather in February. The result was the killing of most fruits, save apples and strawberries. Though these were not winter killed, the crop of each was small. We had more than the usual amount of fungus trouble, but by far our greatest pest was the curculio. It destroyed most of the plums and cherries that escaped the cold, and worked great injury to the apples. It was not rare to find a dozen stings on one apple. Why it came in such numbers, or how to get rid of it, we don't know. Spraying had little, if any, effect on it. But few of our fruit growers spray. Most that do are equipped with inferior pumps and consequently do not get satisfactory results. Thorough instruction in this business, giving every detail in thunder tones and oft repeated, might do a wonderful sight of good.

Horticulture is evidently on the decline in Southern Indiana. With as fine a fruit region as there is in the world, we are now buying most of our apples.

What is the State Society doing to counteract this decline? In a three-days' session the fruit topic appears three times, but one of these is only historical. It is conceded that we can not raise fruits profitably without spraying, yet this topic has not appeared on our program for quite a while. Is it proper to supplant the "Ben Davis" with the "Carolina" poplar? Ought we devote our time and talents to shade trees while our children cry for apples?

REPORT OF VICE-PRESIDENT—THIRD DISTRICT.

E. Y. TEAS, GREEN'S FORK.

The extreme cold winter of 1898-99 injured orchards in our section to a considerable extent, depending somewhat on the location. On the low lands along the streams the injury was general, Concord vineyards being killed to the ground, and most pear and plum trees either killed or severely injured. Peach trees were generally destroyed on low lands.

On the higher clay lands the damage to fruit trees was not nearly so great. On my son's farm, situated in high clay land, overlooking the valley of Green's Fork, land originally covered with a growth of sugar, walnut, poplar and beech, fruit trees and vines were not injured to any considerable extent, his grapes, pears, plums and quinces yielding fairly well, and even some peaches being found. Apples and cherries gave good crops. Strawberries were a fair crop generally, and in some localities blackberries and black raspberries. I did not see any home-grown red raspberries.

Wild rose and sweet briar bushes were, in some localities, killed to the ground. I do not remember ever before seeing these plants killed so badly.

Much is being said by those who are out of joint with everything on this mundane sphere about the unprofitableness of the old dilapidated orchards of our State. I am convinced that they are not all wholly bad.

My son's farm in Wayne County has been used for about fifteen years for rearing and fattening hogs mainly. Neatness and beauty have been looked after only with hoggish eyes; utility in this line being the thing. On the farm is an apple orchard planted about sixty years ago with varieties then in vogue. It made my mouth water to find in this orchard Sweet Bough, American Summer Pearmain and other favorites of my youth. This orchard has not probably been pruned or plowed for thirty years. Some trees have been blown over by the storms, some dead, some fairly vigorous. The crop of fruit the past season was quite good, and as a hog lot, with shade, grass and dropping apples, an ideal summer residence

for a hog. I believe the dropping apples as food for hogs as profitable as the product of any other similar area in cultivated crops.

Another apple orchard on the same farm, containing about eighty trees, twenty-five years planted, is situated in a pasture lot where horses and cattle are pastured. I find stock do not object to a few dropped apples, and if the fruit does not drop fast enough animals will reach up and help themselves without trouble from colic or indigestion. The point is that these old orchards, so out of repute with the up-to-date fruit growers, are still useful on the farm where stock is kept.

We intend to prune, cultivate and spray these orchards in future and increase the product of hog food.

There are some well-kept orchards in this locality where spraying is practiced, and excellent fruit grown. Three or four of these are composed of trees that I sold to the owners thirty to forty-five years ago. The owners now say every tree proved true to label. "These chickens coming home to roost," are welcome.

REPORT OF CONDITIONS AND PRICES OF FRUIT IN ST. JOSEPH COUNTY IN 1899.

GEO. F. NEWTON, VICE-PRESIDENT FOURTH DISTRICT.

After the very severe winter, when spring came with its warm showers, and vegetation had started, the fruit growers watched closely the development of the bud and leaves, for we expected one-half of our trees would be dead, but such was not the case, although a great many trees were killed, mostly peach. I had thirty trees killed in a young orchard of 214 peach trees set in the year 1897. Those that died leaved out, then died, and I noticed that all trees that died were on the poorest part of the ground and had not made as good a growth as those still living. Wherever I found dead trees they had been either diseased or upon very poor soil.

Prices of fruit sold in the South Bend market:

Strawberries	Per quart, 6 cents.
Raspberries, black.....	Per quart, 11 cents.
Raspberries, red.....	Per quart, 10 cents.
Currants	Per quart, 3¾ cents.
Gooseberries	Per quart, 3 cents.
Blackberries	Per quart, 6 cents.
Cherries	Per bushel, \$2.25
Plums	Per bushel, \$1.50 to \$2.00
Apples	Per bushel, 25 cents to 75 cents.

REPORT OF SUPERINTENDENT OF EXPERIMENTAL ORCHARD.

JOE A. BURTON, ORLEANS.

By request of the Committee on Experimental Orchard, in February last I contracted for and had deeded to the Indiana Horticultural Society twenty acres of land in Lawrence County. It is four miles southeast of Mitchell and same distance northeast of Orleans. As this land was recently a part of the natural forest, it contained many stumps. Of these we removed about 300. In one plat we have planted 200 trees for top working. These are to be grafted with scions from specially selected seeds or other scions for special purposes. Another plat contains 280 trees, 140 varieties. These are for comparative and educational purposes. These are set 30x30 feet and the top workers 25x25 feet. We also planted nineteen varieties of Japanese plums. All of these trees are protected from rabbits by veneering shields. Trees were cultivated by plowing, both tree plats being planted to corn. The remainder of the land was in timothy and was mowed for hay. The crops paid for all work on the orchard.

Expenses so far for operating are:

Recording deed	\$1 10
Taxes	2 89
Trees	21 92

The committee not having means at their disposal to press operations, have left it largely to the Superintendent to plan and prosecute the work as best he could without pay. He attempted last spring, by the help of his family and hired men, to cross-pollenize a lot of apple blossoms. As we had never seen this done we were necessarily awkward and the work tiresome. We emasculated and sacked about 2,000 blossoms. On account of the scarcity of pollen, only about one-third of these were treated with pollen. Of those treated about the same per cent. set on as of those left to nature. That the crosses were positively made was evidenced by the fact that those emasculated, sacked and not pollenized set no apples. Because of the general failure of apples we got but little for our work. But we have learned how it is done, so that the work won't be so trying another season. This also was manifest, that the failure of the crop was due to defective pistils rather than pollen. Where we found the pistils perfect, the apples generally set on. We are saving 20,000 to 30,000 seeds of carefully selected apples of several varieties grown where opportunities for natural crossing were favorable. We have consulted high authority

to learn how best to secure germination of these seeds. They will be planted and grown in nursery rows eight to ten feet wide. We propose to demonstrate on top workers whether known varieties will differentiate into sub-varieties. Will graft on the same tree Rambos from a tree that never produced any good apples, along with scions from one that bears fine Rambos, little green Genets and big red Genets, pale Ben Davis, and deep red Ben Davis. Will these be the same when grown on the same tree?

The ground already planted to trees must go to clover this spring. The trees will have to be cultivated by hand, involving much labor. To plant the seeds and cultivate same will be more work. The whole plot should be enclosed by a rabbitt-proof fence. There will be only about five acres of land to yield an income this year. How long your Superintendent can do all these things merely for the love of the business, you would best not try to find out.

An immense field for both mental and physical work opens up. An exhibition of the products of the orchard, when in bearing, 100 to 200 plates of correctly named varieties, and many hundreds of seedlings, will be a sight to cheer the heart of any Indiana horticulturist.

DISCUSSION.

Mr. Johnson: I only have one remark to make in regard to the statement of Mr. Burton. He said spraying did but little good, and then he said but little spraying was done. I thought that was the reason, for I am a firm believer in spraying.

Mr. Burton: But few sprayed, and those who did, got but little help. I have had reports from different parties who have sprayed, and their apples were badly affected, and would not keep. I have inquired about the kind of pumps used, and from the statements received I am not surprised that the work was ineffectual. If nine-tenths of the power you put on a spray pump is to provide a stream back into the barrel, you have very little force to throw the proper spray on the tree. The spray must go in fine particles. If it goes like drops of rain, it will not do proper work. It must go out in a mist.

Mr. Hobbs: What do you think is the cause of the lack of perfect development of the pistils? Is it due to the extreme cold or late spring frosts or fungus?

Mr. Burton: We did not have late spring frosts to interfere with our apple bloom. The cause I do not know. We found the stamens apparently all right, but some did not yield much pollen. We opened the flowers in a stage just before they would open up naturally, and a large number were found with the pistils imperfect. A great many were short or turned down. The cause I do not know, unless it was the extreme cold weather.

Mr. Hobbs: I noticed in the plums especially, the entire flower, including the pistils, were badly injured or destroyed by a fungus disease, and I think that is more common than we are aware. It leads to more failures in the fruit crops than we suppose. I believe a thorough spraying will help immensely.

Professor Troop: Did Mr. Burton find any difference in the varieties in that respect? Did some varieties have more poor pistils than others?

Mr. Burton: We did. We found Grimes with very defective pistils. On the wild crab we found the pistils very perfect and nearly every blossom pollenized and set an apple. Ben Davis showed better pistils than many other varieties.

Mr. Apple: I think in our section of the country our observation is a little different from Mr. Burton's. In my section the apple crop set unusually full. The Grimes were very full, also the Winesaps, in fact all varieties set full and developed very well until after the middle of the season, and then began to rot on the trees, and spraying had no effect. I think I sprayed my trees thoroughly, but the apples dropped badly, and at this time my crop is almost entirely rotten.

Mr. Kingsbury: I hope we have not made a mistake in the appointment of the Superintendent of the Experiment Station, but I confess I have grave doubts about it if it is true that he has no faith in spraying. I was looking for Mr. Flick to ask him to give some statement in regard to his orchard, and the success he has had with spraying, in order that Mr. Burton's little faith in spraying might be strengthened. Mr. Flick has sold almost two thousand bushels of apples from his orchard, and he has very great faith in spraying. He has made it a study and has done it in a scientific way.

Mr. Garretson: I would like to ask Mr. Apple at what time he sprayed, and what with.

Mr. Apple: I did not spray before the bloom appeared, but after it dropped off, when the apple was set on the stem, I sprayed first with Bordeaux mixture and paris green, and in about two weeks I sprayed again. I sprayed until the spray dripped from the leaves. I gave them a thorough wetting.

Mr. Garretson: Mr. Jones, a neighbor of mine, had never sprayed until this year, and he sprayed effectually with Bordeaux twice before the apple bud opened. Mine were not sprayed until after the blossom had fallen off, and my apples dropped badly.

Mr. Hobbs: I believe the most effective time to spray is before the trees bloom.

Mr. Garretson: Mr. Jones also sprayed afterward, but he thinks the first spraying did the most good.

Mr. Johnson: I only rise to confirm what has already been said regarding early spraying. I think we do not generally spray early enough.

Mr. Swaim: I would like to ask whether it is necessary to use Bordeaux in the early spraying. Is not a solution of copper sulphate just as effective?

Professor Troop: I think it is. Either sulphate of iron or sulphate of copper is equally good. The lime is mainly to prevent the burning of the foliage later on.

Mr. Garretson: Will it do just as well without lime?

Professor Troop: Yes, but the lime will cause it to adhere longer.

Mr. Burton: I am the most enthusiastic sprayer in the State. I am the one that follows it constantly in our neighborhood, and I have nearly all the apples. I did state that it did but little good for curculio, and that when improperly done it does but little good. I insist on spraying and doing it properly. I want to state this much, that when I first sprayed my Ben Davis after they dropped the bloom, I sprayed from the west side, and then some days later I sprayed on the other side. The Ben Davis were much better where I sprayed them first. The Winesaps were sprayed on the east side first, and they were better on that side. I think it is very important to spray with arsenical poison soon after the blossom drops. I think nearly all the good we get is by spraying within the first ten days. Spray on one side, and as soon as the wind blows from the other side, spray that side.

Mr. Ratliff: I have been a little skeptical in regard to spraying until this last fall. I was around with my son, who was collecting fruit for the Paris Exposition, and we visited seven or eight fruit growers and had a good opportunity to see the benefits of spraying. I think in every case we found the best apples had been sprayed. There was one orchard that the grower has had the reputation of producing the best fruit in our horticultural district. He did not spray, and the consequence was that his fruit did not compare with those who did. We found some of the finest specimens of different kinds that I have ever seen in our part of the country. I was somewhat skeptical until this was so strongly impressed upon me that I could doubt it no longer. Nearly everyone said they began early and sprayed often.

Mr. Garretson: I would like to ask if spraying before the bloom falls will do any good? Will it do any harm to spray while it is in bloom?

Professor Troop: I am quite sure it would do no good, and would do much harm in destroying bees and other insects which play an important part in the fertilization of the flowers.

Mr. Davis: I have been very much interested in fruit growing, and have a number of trees that I have been spraying for a number of years. I am very much interested in the subject of spraying. I had a couple of apples called Alexander, that were fine for a number of years, and then began to get scabby. Despite my efforts, my apples were scabby, and I hoped to get some information as to why it was. I have sprayed those trees for a number of years, and my younger orchard bore very perfect apples, but the last three years they have been scabby. I sprayed twice before the blossom had fallen, and once after. The trees were very full. On some I shook off a number of the apples. The Alexander, as well as some other imperfect apples, were on a hill where they had not so much water. I thought perhaps it was lack of vitality. If we would throw on some straw or fertilizer around our apples they might be better. This year I have had many imperfect apples. I have been unable with anything I could do to correct the difficulty I wish to correct. I have not so many apples as I have cherry, pear and plum trees. My freestone plums did me no good this year. I have some two hundred of the younger varieties, and while I sprayed early, the fruit buds fell off. I have not made just the success I hoped for. The extreme winter killed and damaged a great many Kelfer pears. In the early spring I cut off the frozen parts and plastered with grafting wax, and have been successful in part with that. If there is anyone who has had experience with fertilizing trees and has produced more perfect apples, I would like to hear from them. I have a perfect spray pump, and have a man to operate that while I operate the nozzle, and I throw the spray all over the tree. It is constantly stirred from the bottom. I have three pumps, but I use the large one, as I can spray the tops of the trees. The nozzle throws quite a stream. I find that my richest, lowest ground produces the best fruit.

Mr. Hobbs: I think probably the trees lack vitality. As to spraying for scab, that must go on during the season, because it is an affection of the fruit itself, and may develop any time between the setting of the fruit and its ripening. We must get a more thorough fertilization of our bearing orchards.

Mr. Garretson: I manured my orchard, and plowed and cultivated it, and at no time can you go in there and kick up the ground without finding the dirt moist.

Mr. Burton: I want to make my statement before Mr. Morrill comes. I don't expect he will bring any pumps. Mr. Davis thinks he has a good pump, but you may take this as a solid fact, that with one man pumping, there is no pump that has a return stream to agitate your mixture that

can do good spraying. You must have a mechanical agitator of the water. Let the water you pump out go on the tree and not return to the barrel.

Mr. Hobbs: I think a young orchard may be over-stimulated by extensive cultivation. That is not the case with bearing orchards.

Mr. Henby: If I did not misunderstand Mr. Burton, he has two varieties of Ben Davis apples. Now that is an idea that has been prevalent in our neighborhood for some time. I have always insisted that there was but one variety of Ben Davis, and I have been asked since I came here if I knew anything about two varieties of Ben Davis. If Mr. Burton has another variety, I would like to know something about it.

Mr. Burton: I suppose Mr. Henby has observed that some are paler than others. That is what I referred to.

Mr. Hobbs: Within the last two or three years some very close observations along this line have been made at some of the Experiment Stations, showing the possibility of differentiation of varieties and the establishment of new varieties. Among florists that is a fact, but we as fruit growers have given it little attention. I think if Mr. Burton would follow these observations he will discover that there is quite a variation in the same variety. There is also a certain amount of close relationship. The Gano is a red Ben Davis. The Gano is perfectly red, but in every other respect resembles a Ben Davis very closely. The trees are identical, but the apples are distinct. Professor Bailey has carried this so far that in his own orchard he has selected his grafts and planted Winesaps to top work, and is selecting typical Baldwins, Kings, etc., to graft with.

Mr. Grossman: That brings up a question I wish to ask Mr. Burton. What variety he thinks best for top working?

Mr. Burton: I don't know what would be the best. The committee sent me Duchess, Aiken, Peter, and one more.

Mr. Custer: I found the past season that my Ben Davis apples were all more colored than ever before. On trees close together, where the sun could not get at them, they were not so highly colored. I attribute the high coloring to the sunshine.

Professor Troop: I want to say a word about bud variation. I have four Missouri Pippins in the orchard, all set out at the same time and all bearing, and there is as much difference as you can imagine between them. Two I would not think of cutting scions from at all, while the other two bear regularly and have fine large fruit, that I think will average twice the size of the other fruit.

Mr. Ratliff: I remember about fifty years ago an old nurseryman came to my father's with an idea that he had on this same subject, but

his theory was that the graft partook somewhat of the nature of the tree upon which it was grafted. Then the grafting was done above ground. They cut the tree off, and then inserted the graft. His idea was that it was the continuous bark, and consequently the graft would partake of the original stock. He had grafted the Bellflower on a sweet apple, and he was of the opinion that he had made a great change in the acidity of the Bellflower. Just how far that would go, I do not know, but this discussion reminds me of the old gentleman's argument.

Mr. Teas: Most of you know something about the abutilon or flowering maple. Some have leaves all green, and in some varieties the leaves are white. I have tried several times to graft the white leaves on the green leaves. If the green leaf is the stronger, the white leaf will turn green; and if the white leaf is stronger, the green leaf will turn white. I have tried that long enough to know. I am fully convinced that the root affects the fruit somewhat in various degrees, according to the vigor and strength compared with the top.

A letter was read from Mr. Bracket, of the United States Pomological Bureau, in reference to an exhibit of fruit for the Paris Exposition.

Mr. Burton: I do not know how much Indiana has sent out. After being invited by Mr. Bracket, and also by Professor Troop, I did decide to send two barrels of apples to Paris. If we can get an exhibit next fall, I think we should do it. Some of our apples could be sent to Paris without refrigerators.

Moved that a committee be appointed to look after the matter, and report to Mr. Bracket, in regard to sending fruit to Paris.

Professor Troop: I think Indiana ought to be represented. Other States will be. It is unfortunate that the fruit crop is in the condition it is. I believe that at New Orleans there was one plate on exhibition from Indiana, and there was none at the World's Fair. Now we are again unfortunate in having a crop that is keeping so poorly that it is hardly likely we will have any there. People will get the idea that Indiana does not grow any fruit.

Mr. Hobbs: I wish to say that this matter was brought before the Executive Committee, and we decided that we could not do anything as a Society on account of the shortness of funds, but our Secretary was directed to correspond with the fruit growers of the State and do what he could from his office in making this collection, and it has been done. He has sent out a number of letters, and as a result has got a number of exhibits. Now what additional a committee could do I do not know, but I am willing to have a committee if it is your pleasure.

Motion carried.

The following committees were then appointed:

Resolutions—Mr. Tilson, Mr. Porter and Mrs. Stevens.

President's Address—Messrs. Custer, Swaim and McMahan.

Exhibits—Messrs. Tea, Stanton and Campbell.

WEDNESDAY EVENING, 7:30.

The first on the program was a paper on

CO-OPERATIVE HORTICULTURE.

J. W. MOREHOUSE. ALBION.

Co-operative horticulture implies a coming together of those engaged in this class of work upon a common plan.

The object to be attained is to better the condition of all those now independently engaged in this business.

It implies unity of purpose for a common end. Co-operative horticulture may include the purchase of supplies, such as stock, box material, baskets, etc., in large quantities, thereby securing wholesale prices. It implies a necessity for uniformity in the size of measures used, a condition greatly to be desired both by buyers and sellers. Whether we have co-operative horticulture or not, the custom of selling short quarts ought to be abandoned, and a full quart made the rule everywhere. I have always looked upon horticulture as the refined part of farming and have entertained the idea that those who love to cultivate fruits and flowers would combine with that love a high sense of honor. I can not reconcile the use of a short quart with strict integrity.

Outside of this business those who use short weights and measures soon lose credit, and with loss of credit comes loss of patronage. Can it be otherwise with the horticulturist who uses short quarts? This brings us to consider for a moment that imperishable law implanted in the heart of man that we are social beings, always and under all conditions, interdependent upon each other.

If man were an independent being, then each man could supply his own wants best by direct effort. But as civilization reaches out and lifts mankind up from a state of barbarism, the farther he recedes from an uncivilized state or condition, the higher he rises in his knowledge of

the arts, science and literature, the more he feels the necessity of society, the greater are his wants, the more dependent he becomes. But when we consider the condition of civilized society (even with its many wants and imperfections) with the condition of the barbarian or semi-civilized people, we at once instinctively say any reasonable proposition to further unite and build up society is worthy an effort.

Co-operative horticulture is to-day a condition only faintly outlined in the minds of some. The desirability or necessity for such a condition has not yet been established. The question naturally arises, why should we surrender our present independent plan of propagating fruits, vegetables and flowers to another condition in which we may be called upon to yield a point here and again another there. And he who would invite you to leave old and well trodden paths in which you have found pleasure and profit for almost a lifetime must present some very alluring or substantial argument, or both, for the proposed change.

My idea of co-operative horticulture is that no well-tried, pleasant and profitable paths be changed, but only widened, deepened and made more attractive and profitable if possible. And while all along the line of horticulture there may be good reasons for co-operating, I shall only attempt to advocate it in fruit growing along one line at present. When the first apple orchards were planted in our State, the soil was new and rich in all the essentials required for the growth of trees. It was as nature had made it, adapted to the growth of strong, healthy trees. Witness the gigantic forests of our State.

After planting, but little attention was required to grow bountiful crops of fruit. As soon as apple trees came into bearing, we could depend upon a crop annually. The bounties of nature at these times led to carelessness and neglect on the part of horticulturists. As a result, where at one time nearly every farm in our State had an orchard in profitable bearing, now, perhaps not more than one orchard in a hundred bears fruit with profit to its owner because of the decayed and dilapidated condition of the trees, rendering them unproductive and their fruit of an inferior quality, and because of other changed conditions. Formerly, any kind of apple that could be converted into cider and ultimately into vinegar, was a profitable apple to grow, and to supply our local market I have known winter apples, choice varieties, to sell at one dollar per bushel. But the making of vinegar from water and chemicals and the increased facilities for transportation, cheapening the same and bringing the producer and consumer near neighbors, in other words, shortening the time between the point of production to the point of consumption, have entirely changed the conditions necessary to success to-day. Now the old orchard is no longer in the market. The former varieties planted and plan of cultivation, or rather lack of cultivation, will no longer answer the purpose. New varieties, more suited to the changed conditions of soil and the demands of the market, should be planted. Old varieties that have stood the test of time

and that have always found ready sale in the great commercial centers of trade, when offered in prime condition, should be planted, pruned and cultivated to meet the new and changed conditions of soil and open competition.

Formerly the neighboring town was our market; now, owing to cold storage and rapid transit, the world is our market and our competitor. In selecting apples for show last fall I have picked from trees bearing from five to fifteen bushels each, and the five or ten apples selected were the only ones out of the entire lot that were perfect fruit and fit to show. Not more than one bushel in ten was fit to barrel and place upon the market. Nine bushels wormy, spotted, imperfect fruit to one that would barely do to ship is not a profitable commercial orchard. It is estimated that millions of dollars worth of apples rotted in transit this year. Some attribute this great loss to warm weather. Why did not all apples rot? Those gathered from young, healthy trees may be found keeping in good condition to-day, and I might add here, the condition in which our apples have reached foreign ports this year has been so bad as to lead some countries to place their orders elsewhere. Our reputation for the future has been weakened. Some people maintain that by spraying, old orchards will regain their former vigor and bear healthy fruit in paying quantities. Upon this theory I am somewhat skeptical. It is as difficult to produce sound fruit from old, decayed trees in profitable quantities and of good quality as it is to produce healthy stock from diseased ones; a strong, healthy stalk of corn from a damaged kernel, or healthy potatoes from scabby seed. You have only to take up nature study to prove my theory correct.

But why insist upon co-operative horticulture? If necessary, why can not each farmer whose orchard has grown old, plant a new one, according to his own plan, to meet his own wants best? Every farmer should produce fruit enough to supply his own wants.

But every farmer does not care or is not in position to plant and cultivate an orchard for commercial purposes large enough to attract the attention of buyers from the large centers of trade and invite that degree of competition that will insure ready sales at remunerative prices. By co-operation an orchard can be grown in any county of the State, large enough and containing fruit of a quality to not only attract the attention of buyers in this country, but consignments of apples could be made directly to European markets if quotations justified it.

To illustrate: One man in a county has an acre of choice winter apples of varieties that will sell in any market, he can not produce enough to induce men to come from a distance to buy. But suppose 100 men on adjoining farms, each having an acre of choice winter apples, should advertise the possible product for sale. Now the possible product of 100 acres at a conservative estimate would be 50,000 bushels. This alone would insure ready sales at remunerative prices. There are in an ordinary county

3,000 farms. In time we ought by the plan of county co-operation to secure an orchard of at least 2,000 acres, with an annual average product of 900,000 bushels, and then you will readily see we would have demands for our fruit from all over the world and could choose our market in which we would sell. How may we secure co-operation in this matter? First, we must have a thoroughly well organized society in each county, officered with energetic and progressive men and women, those with firm convictions and who are willing to work and wait, for the time required to complete a scheme of this kind is the greatest bar against its accomplishment.

We have already demonstrated that in the Noble County Horticultural Society we have some of the pluck and energy necessary to success in whatever we may undertake, but should we venture upon this scheme it remains to be seen whether we will have the firmness to stay by the work to a finish. What may the society do by way of inviting co-operation in this matter? First, we should devise and determine the most complete domestic and commercial orchard. This would include varieties, number of each and size of orchard. However, this would not in any way debar the individual farmer joining this movement from selecting his choice of varieties to plant or from planting one acre or as many more as he might choose.

Then we should establish an agency within the society through which trees could be secured from a reliable source and at a less cost than by any other agency. Then by issuing a circular letter setting forth our plan in attractive style, together with an order blank sent to each farmer in the county, the work would be begun.

But many farmers of to-day are, like the orchards, growing old, have passed the high point of efficiency and are on the down grade.

Why should they plant orchards the fruit of which they may never see? The farmer of sixty years ago pushed back the forests and cleared the land that the farmer of to-day might come into possession of cultivated and fruit-bearing farms. One of the highest duties we have to perform is to build up homes that future generations may enjoy, and the home of the future citizen of Indiana should possess an abundance of all fruits that may be grown here, and especially of that most delicious and health-giving fruit, the apple.

CO-OPERATIVE SHIPPING AND SELLING.

J. W. STANTON, OF ILLINOIS.

I hardly know what phase of the question to talk about, but I will state our own experience where I live. It will probably come nearer what the paper aimed at than anything else. I live in southern Illinois in the

fruit belt, where you can ride all day and not be out of sight of an orchard. We raise strawberries by the car load. At my place we have an organization and have had it about eight years, and it has worked very nicely. At nearly every station on our line from Centralia south there is a shipping association, and sometimes two. I presume fruit growers in Indiana are like the are in our State. They are pushing and somewhat jealous of each other and an association will probably last only one season. In some places we have two or three associations and still they are able to ship a car load per day, but they have different ways of handling. At my place we have never had any trouble. In fact I have been president ever since the association was formed. We do not pay any salaries and there is no trouble on that account. We organize by electing a president, secretary and an executive committee. The president and secretary have full charge of the business and whenever the crop is ready to ship we usually order a car and arrange for a man in Chicago, where we ship most of our goods, to unload our goods there and arrange for a man to load them at the station. We have receipt books like the express company, and we furnish every member with a receipt book. When he drives up to the car with his berries his receipt book is signed and he enters it up on the manifest, that is his list of every crate, to whom and by whom shipped. It is consigned from the president of our association to the unloader in Chicago; therefore, it is shipped from one man to one man, but the shippers ship to whom they please. The unloader will unload the car to the parties to whom it is marked and he will pay the freight and collect pro rata from each consignee, so the man that gets one crate pays the same freight as the one who has 100. The goods are sold the same as though shipped by local freight and the commission merchant makes returns to the man who shipped the goods, so there can be no dissatisfaction on that score. They may also be sold outright. There are inspectors to inspect the fruit. Where there are only a few, my opinion would be that the best plan is to ship from one man to one man and let the returns come to each one so they will know what their stuff sold for. I might say in regard to co-operative shipping that we had a law passed by our last legislature providing for a board of inspectors who should supervise the handling of fruits by commission merchants. Our experience has been that if we only knew we got what our stuff sold for we would be satisfied, but so much stuff is reported unsalable that the legislature was appealed to and they passed a law providing for a board of inspectors and placed the commission men under this board. The law went into effect in July, and I have the honor of serving as one of those inspectors, and I learned considerable about the inside workings of the commission business. They also went into the Supreme Court last week and declared the law unconstitutional.

In regard to cold storage, I would suggest that the meeting ask questions. Year before last the markets were so low that it looked like we could not go anywhere and make expenses. I had a telegram from Buffalo

wanting a car of berries. That was almost unheard of, as the weather was so warm, but we shipped two cars and had a good many left over, and I had a car of ice and put those berries in it, and I said to them, "I may send these on a wild goose chase." They said, "Send them wherever you please." I put in a good many of my own to show that I was sincere. I said to each one, "You may send to Buffalo if you desire, but it is only an experiment." We shipped it and it was five days until it was sold, and they reported them in fair condition. We had the car cooled for twenty-four hours, which is very necessary in shipping in refrigerator cars. Our stuff got there in good shape. We have no cold storage plant in our district. We have a small cold storage plant at Centralia, but it is not satisfactory. It is better to have a place where you can pull them out and sell them. If you have to take them out of cold storage and then ship them it is hard on the apples. There will be a change in the stock. If you want to hold your apples, you should ship to where they can be held in cold storage. There are different methods of cold storage. Some use ammonia and some use ice. I have heard cold storage men differ on the degrees of cold, so that I do not care to state the number of degrees. It is important that the temperature be regular. I had charge of the Illinois fruit exhibit at the Omaha Exposition, and we had to bring our stuff out of cold storage. We had to change that fruit from Chicago to Omaha and then there was some change from Omaha to the exposition grounds. Any little change will start the fruit. There is one thing important in cold storage of apples and that is you should pick your fruit just before maturity. Pack it carefully into the barrels, and just as soon as you can get the barrels to the car and get them in cold storage, do so. It has been demonstrated that an apple picked just before maturity and put into cold storage will hold up, but after you take it out it begins to develop and it does not mellow as quickly. You can put up Jonathan in August and keep it until December very nicely. Grimes Golden is also a fall apple and you can keep it nicely.

Our country is well adapted to all kinds of fruit raising. It is better adapted to that than anything else. We had, years ago, quite a colony of eastern people and they thought they could not live without an orchard, and they planted pretty largely of what did well at home, but those orchards now have not the varieties we want and some are not fit for our country at all, and we can see the necessity of knowing what is adapted to that locality. A distance of seventy-five miles makes a difference in the growing of apples. Where I live I can not grow Winesaps, but seventy-five miles south of me they grow very fine Winesaps. If anyone has an orchard and people find out there is money in it that is about the only thing that will make them go into it. Whenever you can show people that there is money in anything they will go into it. Senator Dunlap has 250 acres of land worth \$85 per acre, all in orchards.

In putting apples into cold storage you only put them there to keep until a time when you want to sell them. You can put them in for 10 cents per barrel per month and can sell them whenever you get ready. If you put apples up right they will not spoil in cold storage. This year in our country the only trees that bore apples were the old trees from fifteen to forty years old. I take it that the extreme cold winter last year hurt all fruit trees. I do not believe there was any kind of fruit trees that were not damaged by the winter. I believe it weakened the apples until they lost vitality. Everything seemed to prove that afterward I had about 10,000 bushels of Ben Davis apples and sold every one on the tree because I got scared. I will say this about putting apples up for the Paris Exposition, All the apples we have put up have been wrapped twice. We selected them very carefully and put them into cold storage. They will not be disturbed until we get ready to ship them to Paris. The wrapping will be a great protection. I put apples in two thicknesses of paper for Omaha and they kept very well. They looked bright and hardly had lost their bloom. An apple not wrapped will show the change of temperature and look like it was scalded and look brown and dead. I anticipate that these apples put up and double wrapped will open up bright and nice. This year we have had some experience in that. The man I sold to put up about 2,000 barrels. I was around when he was repacking and there were apples that had not a particle of defect apparent, but were entirely rotten. Where there was a defective apple it would be partly rotten, but a great many were entirely rotten. We had an evaporator at our place and I took a specimen that happened to get into it and was apparently sound but a little bruised. I took it to the girls and had it sliced and found there was a brownish color at the core, but you could not see anything from the outside. What caused that I do not know. I never had my attention called to it before. I asked the evaporator man if he had noticed it before and he said "no." My opinion is that those were the apples that rotted entirely, and I also have an idea that it was the scab that affected those apples at the time they began to form. It may have been the cold weather. If we live long enough to be old men in the business we will find out how little we know about these things. I am going to cultivate. I believe it is a good thing.

DISCUSSION.

Mr. Morehouse: I hardly think the subject of co-operative horticulture or co-operation in the raising of apples is interesting to this meeting. I quite understand that the idea I had of the matter is not understood, and with your permission I would like to make myself clear, if possible. I do not think that I have a plan that reaches out and takes in the State. It was intended for the county. I think successful co-operation might be planned and executed in a county, but I do not know whether it could take

in the State, but my theory in the beginning is, that the old orchards have lost their vitality. They are no longer able to produce sound, healthy fruit. I have no dispute to make with the scientific gentlemen who advocate spraying, but I believe you can spray until you are tired of it and you can not produce good, healthy fruit on an old, diseased tree. My idea is, that if we, in our section of the country, would succeed in the future in raising apples for commercial purposes, we must plant new orchards and cultivate them right, and care for them, and in time, by co-operation in the county, we may have a commercial orchard, and with a large number of farmers adjoining and raising the same kind of apples, the farmers would be at perfect liberty to sell their fruit where they pleased, but with a number of farms adjoining there would be an inducement for people to come in and buy those apples.

A Member: What number of years does it take to make an old orchard?

Mr. Morehouse: It depends on the care of the orchard. They are all old at 40, 50 or 60 years, and have gone beyond the limit of successful bearing. There are many orchards that are of no profit to their owners. There are a few young orchards in bearing, and from these trees apples were picked and stored, and keeping in fairly good condition.

The question of life membership in the Society was brought up by the Secretary, in response to many queries from members, and after a full and free discussion, it was moved and carried that "hereafter no life memberships will be accepted in this Society."

THURSDAY MORNING.

The first paper on the program was entitled. "A Plea for a More Complete Organization of Horticulturists," by J. C. Kimmell, Ligonier.

A PLEA FOR A MORE COMPLETE ORGANIZATION OF HORTICULTURISTS.

J. C. KIMMELL, LIGONIER.

It is needless for me to discuss the benefits to be derived from the organization of those who are engaged in horticultural pursuits.

Organization is Nature's way of accomplishing great purposes.

Behold the Mississippi river, with its many tributaries, each beginning at some spring or brook in the mountains.

Look into that matchless organism, the human body, composed of bones, muscles and nerves, each performing some particular duty accurately, and distinctly, yet all acting in harmony and under perfect control of the will.

I might mention many examples in the physical, social, political and religious world that would serve to illustrate the benefits of organization, but that would be useless as these facts are too well known by all.

Those who have been attending the annual and summer meetings of the Indiana Horticultural Society for years are only too glad to testify that they have received much enthusiasm, encouragement and information that could come from no other source.

In the face of all that may be said of the influence and usefulness of our beloved State society stands this obstacle: According to the 1898 report of the society only 307 members are receiving these benefits: twenty-one counties have no State members; twenty-six counties have each but one member, and in twenty-eight more counties you could count the members on the fingers of one hand. The question naturally arises. How shall we extend the privileges which we as members of the State Society enjoy to others?

A reasonable answer to this question would be to urge people to join the State Society.

That will do in some cases, but in many instances it will not work: we must take the organization to the people, get them interested and they will gladly join the State Society. This can only be done by organizing local horticultural societies in every county in the State. Hold the meetings monthly at the homes of the members and thus get the people interested by taking the society to the masses. I have known farmers to attend horticultural meetings out of respect to their neighbor who was entertaining the county society, become interested, take part in the discussions and before going home join both the State and local societies.

Before going into detail in discussing this theme, I desire to call your attention briefly to the State organization as it now exists.

The State is divided into four districts, each in charge of a vice-president, who is expected to organize county societies, look after the horticultural interests of the district and make an annual report to the State Society.

The southern district is composed of eighteen counties in the southern part of the State. There are twenty-two members of the State Society residing in this district. Floyd County has the only local society and there are five counties in this district that have no State members.

As a remedy for this condition, I would suggest the organization of seventeen local societies and an earnest effort to increase the State membership. Just north of this district lie twenty-four counties which constitute the south central district, with its four local societies—Monroe, Shelby, Johnson and Fayette.

This district has sixty-two State members. Seven counties are as yet without State members.

Twenty new local societies would have much to do toward swelling the membership to the State Society.

The north central district, with its twenty-six counties, well deserves to be called the banner district.

One hundred and sixty-two State members reside here and the district has six local societies, viz., Marion, Wayne, Clinton, Howard, Grant and Cass.

Only three counties in this district are without State membership. As a further stimulus to better things and grander achievements, those unorganized counties should be organized at once.

The twenty-four counties in the northern part of the State form the northern district. Seventy-one State members reside here and three local societies—St. Joe, Huntington and Noble—have been organized.

As long as six counties have no State members and twenty-one counties are without local societies, there is need of systematic organization.

You ask, How shall the work of organization be accomplished?

I would suggest that we begin the campaign of organization to-day, and keep it up until Indiana has ninety-two live, enthusiastic local societies, all working in harmony and under the direction of the State Society.

In order that this work may be accomplished speedily and systematically, I am in favor of creating the office of State organizer, whose duty it shall be to arrange dates, plan routes and call horticultural conventions and keep the vice-presidents at work in their respective districts until their territory is organized. I would have the vice-presidents organize the societies under the direct supervision of the State organizer.

I believe that the State organizer could arrange an itinerary of two weeks' duration (twelve dates) for each vice-president, having them work simultaneously, and out of the forty-eight meetings they would organize nearly as many societies. One obstacle that confronts us at this point is a lack of funds to carry on this campaign of organization. I believe that each newly organized society will willingly pay all expenses incurred in its organization, including mileage, entertainment and a reasonable compensation of the vice-president.

Before closing, I wish to speak of the relation that should exist between the State and local societies.

Some local societies are well represented in the State Society, while others have scarcely any representation at all. Marion County has forty State members; St. Joseph, twenty-three; Wayne, nineteen; Noble, fifteen; Fayette, eleven; Johnson, nine; Monroe, eight; Cass, six; Grant, six; Clinton, three; Howard, two; Shelby, two, and Floyd, one.

There appears to be a lack of co-operation in some societies, or perhaps

it is a matter that is not considered of sufficient importance to engage the attention of the officers of the local societies.

The local societies should all be required to send a monthly report to the Secretary of the State Society, using blanks furnished by the State Secretary.

This will keep each organization in close touch with the other.

Trusting that some decided action may be taken as an outgrowth of the suggestions I have offered, I leave the matter with you for your consideration.

DISCUSSION.

Mr. Garretson: He spoke of having all under the supervision of the State. Our county organization is over twenty years old, and there has not been over a month in that time that we have not had a meeting. If we were under the supervision of the State then we would know what we are doing.

Mr. Maish: I would ask what plan Mr. Kimmell has for providing funds for putting an organizer in the field.

Mr. Hobbs: His idea was that the local society's membership fees would pay the expenses of an organizer. It has not always done that in the past.

Mr. Henby: My friend, Mr. Stinger, and one or two others and myself made a very active effort to organize a society, and succeeded in getting a good membership. That was at the time when our friend Dr. Furness was President of this Society, and by his assistance we succeeded in organizing a good membership. We had very interesting meetings for quite a while. Most of our members were Methodists, and we had regular old-fashioned Methodist revival meetings.

Mr. Burton: If we appoint a State organizer, and make no provision for his expenses, I have an idea there won't be more than about six candidates for the position. We maintain our organization as long as we get good attendance. It is not the main thing to organize, but there must be some show of its going to live.

Mr. Ratliff: We have had about the same experience in regard to keeping up the interest, although we have not yet stopped for any length of time for the last forty-two years. We have had great difficulty sometimes in keeping up the interest until we effected an arrangement with the county agricultural society, and that seems to have set us squarely on our feet. We take entire charge of the horticultural exhibit of the county agricultural society. The agricultural society pays the premiums and we take our chances in getting premiums the same as any one else. There is no trouble about our members keeping up their membership as long as

they can have the benefit of the fare getting in and out. I think that is one of the best arrangements that could be made in regard to keeping up the interest in horticultural societies. Why not combine the horticultural and agricultural societies, especially in time of fairs? In our horticultural meetings we make out a program and select the best talent we can for a paper at each meeting during the entire year, and then the subject of the paper is the subject for discussion. Wherever it is possible to combine the two, I think it is the best thing to be done.

Mr. Hobbs: I think Mr. Ratliff has struck the keynote of the whole matter. There are very few neighborhoods in the State where the horticultural interest is sufficient to command enough people to constitute a good lively society, but in every neighborhood there are enough farmers and horticulturists to make a good lively society, and by combining the two I think we could effect an organization in every county in the State, and should do it if possible. As to the frequency of meetings, there are so many things to occupy our time and attention that if we keep up the regular attendance once a month we feel it is pretty hard, and we have not the time, and if we could meet once in two or three months, and maintain the society better by meeting less frequently, I think it would be better.

Mr. Kimmell: Some questions have been asked. The first one is, how to raise funds for a State organizer. I would not have a regular State organizer, but have him remain at home and correspond and keep the Vice-Presidents at work. I think the Vice-Presidents should do this work. It is their duty. What we need now is some one to stimulate them to keep up the work. I believe if the State organizer will impress the fact that the State Society has no funds, and urge them to be prepared to pay the expenses and a reasonable compensation, they will do so.

Second. How to keep up a society. I believe by the combined efforts of the men and women in the society to get in good farmers and fruit growers who are interested, that we can keep up the society for forty years. The frequency of meetings is an important question, and I heartily agree with our President. The first year of our organization we held our meetings promptly, but it seemed quite a sacrifice on the part of some to attend all the meetings, so when we entered on our second year's work, we planned to hold meetings every two months, and we found it better.

Mr. Campbell: This seems to be an experience meeting, and I will give an experience of the Monroe County Society. It was fourteen years ago we started with eighteen members, and since that time we have never failed to have regular meetings once a month, except during the extreme cold weather. Our annual meeting for the election of officers is the second Wednesday in March. From that on we meet every month during the summer until about November, and our society has grown in interest ever since it was organized. We have good attendance. The young

people are taking considerable interest. Sometimes they give a recitation or read a paper. We always have a good dinner, which is also an attraction. I believe the great trouble in many cases is that the horticulturists do not take the interest in it that they should to make the meetings interesting and profitable. Last year we changed the name of our society. It was formerly Monroe County Horticultural Society, but now it is called Monroe County Agricultural and Horticultural Society.

Mr. Johnson: I fully agree as to the combination of the two societies, but there are a great many counties that have no agricultural society. I would advise the horticultural societies to name themselves Agricultural and Horticultural, as that would give them the benefit of the license fees from shows, and it is not an improper name for it.

Mr. Campbell: That is the reason we changed our name.

Mr. Grossman: I am glad for the information the gentleman has given us. I decided this fall that we would organize in Lagrange County. We have only partially organized. We met last Saturday and started to organize, and my idea was that we would name our society the Agricultural and Horticultural Society of Lagrange County. Then we could get the license fees, and get the best people to belong to it. The fruit growers do not attend, as they do not get enough profit out of it. I believe this work should be carried on.

Mr. Thomas: If a man knows anything and is not willing to impart it to some one else, he is not a true horticulturist. If we want to have a local horticultural society, we do not need to wait for a State organizer. We decided to have a local society, and we have almost continuously kept up our meetings monthly. We have usually had our best meetings in June, when we had our strawberry show. In regard to not holding meetings so often, I have been agitating holding meetings quarterly. We find when we have been able to get our meetings reported in the newspapers it has been a great benefit to the society. We have a regular program committee, and have music, recitations and papers. Yesterday I had a conversation with some of the leading farmers in our county, and at the last institute they arranged to have a monthly institute over the county. Those workers suggested that the horticultural society join with them, and I think it is a good idea.

Mr. Clore: It seems to be a settled fact that there is a great power in printers' ink. It seems to me that some good literature on horticulture would be a good thing, and I would like to know what is the best literature we can get along this line.

Mr. Swaim: It is one thing to organize a horticultural society and another thing to keep it in existence. This Society a few years ago set

apart some money for organization. A number were organized and a number are dead. Simply because people are not willing to sacrifice a little time and labor to keep it going. The greatest difficulty is in keeping up the interest and holding membership.

Mrs. Campbell: You will have to get the young people interested. We have been working eleven years in this work, and we find the only way to keep it up is to get the young interested. We have in our society a number of people who have large families. They bring their children. You must teach the young to grow up with us. You know the old minds get rusty, and the young minds brighten up the old ones. We appoint a committee about the first of the year for the whole year and not a single one has failed to come up to time if they were able to get there. We have part of the program by the young people. We even have speeches by the little tots.

Mr. Swaim: We have the same experience in our society.

Mr. Hobbs: I think this paper has brought out a very profitable discussion. If there is anything more definite or practical, let us have it in the form of a resolution. We have the machinery for this work, and I can not see that we can gain much by putting some one else over them.

Mr. Brown: You have struck the keynote. If the Vice-Presidents will do their duty, and the Society will assist them, we need have no other organizer.

Mr. Kingsbury: It seems to me if we can convince the farmers that they are losing an average of \$500 per year over what they might receive if they cultivated their fruit and took care of it, that that would be the solution of this important question. I believe this to be a fact, and by employing in each community a man, or a sprayer, to take care of the insects and save the fruit, they can secure the addition to their present profit of at least \$500 per year. I think they can do that. The money question is one that interests people most.

Mr. Garretson: I would be glad if this Society would hunt up those societies that are working, and they will find out what is being done.

Professor Troop: While on the subject of co-operative horticulture, I will say that many of these local societies, when they come to make up their reports, are not represented in the State Society. Only a few send in reports to the Secretary of the State Society for publication. I wish those who are here, when they go home, would send a full report to the Secretary.

Mr. Garretson: I would like to offer a resolution that the Secretary send out printed blanks for reports. I don't think the secretaries understand what is wanted.

Mr. Burton: We want live reports, and not just statistics.

Mr. Maish: I can not see the necessity of having a formal blank sent out, when every secretary has his duty plainly laid out.

Mr. Johnson: I was called on by a Vice-President to hear him read his report, and it is a model. It is just such a report as we want, and I want it read before the Society before it adjourns. There is no blank wanted. It should be original.

Next was a paper on

THE LOCAL HORTICULTURAL SOCIETY'S PROGRAM.

J. C. GROSSMAN, WALCOTTVILLE.

You have just listened to an able and very earnest plea for a more complete organization of horticulturists. And it is my desire now to have your attention for a few minutes upon the subject of the local society's program. Some may deem the program of minor importance and think it unnecessary to give its preparation and arrangement much thought or study, but I deem it of the utmost importance and one that should be given a great deal of thought and study by the committee who has its arrangement in charge, for upon its character and the manner in which it is conducted depends, to a great extent, the life and success of a society. Therefore, if we would keep alive and prosperous our recently organized societies, and put new life into the old, the monthly program must be made so interesting and valuable that none can afford to stay away from the meeting.

The program committee should be capable and know the needs of the society and should be acquainted with the abilities and talents of the members, so that in selecting and assigning subjects they may select those that will prove of the most practical benefit to the greatest number and assign them to those members who are adapted by experience or otherwise to present them in the most interesting and practical manner.

The essayists should be brief and to the point, and the committee should have a prearranged discussion of each subject whenever practical. The rule should be: Live topics, briefly, but clearly stated, followed by animated discussion.

Great care should be taken that the program is not crowded with too many subjects, thus crowding out all discussion, or being obliged to carry some subject over to the next meeting, thus taking up the time of the next regular program.

The crowding of programs is a very common fault. You can see it in all societies, in farmers' institutes, etc. In looking over the program of the recent biennial meeting of the American Pomological Society, I counted twenty-eight papers, many of which were of great length and presented matter that was not new.

Now that meeting, no doubt, was of great value and interest to those in attendance and those papers will be read with interest and profit by all who are so fortunate as to receive copies of the printed proceedings, but could not that meeting have been made much more valuable and interesting to all concerned if the number of papers had been reduced to the really new and live topics among the twenty-eight presented, and then time given for their thorough discussion by the distinguished and able horticulturists present?

So let us profit by the experience of others and place but one, or, in exceptional cases, possibly two subjects upon our local program for discussion each month, and let these be timely and in season. For example: If the local society has the subjects of "Winter Apples," "Spraying," "Cultivation," "Strawberries," etc., upon its yearly program for discussion we would place the subject of winter apples on the program not later than the month of January and would have as large a list of apples on exhibition as could readily be collected, so that in the discussion of the paper the different varieties could be examined and studied, thus enabling any who were contemplating planting new orchards to receive much more practical benefit from the paper and the after discussion than otherwise could be obtained. And likewise the other subjects. Spraying should be treated just previous to the time of spraying and should be accompanied with an exhibit of apparatus and specimens of the insect pests. The subject of strawberries in strawberry season, with a good show of fruit for examination and testing, not forgetting the sugar and cream. And so through each month of the year, with exhibits of products and articles each month.

Premiums should be awarded to all meritorious articles and products in competition in so far as the society is financially able to do so.

Standing committees should be appointed for the year of one member each to report on insects, birds, flowers and ornamentals, orchards, small fruits, vegetables, meteorology and such other subjects as the needs of the society and locality might demand.

These reports should be brief and concise, and not occupy more than from two to five minutes of time each. Each local society should also have a reportorial committee of one member for each local paper published in the county to report the proceedings of the meetings for the benefit of the general public, and I can assure you that these reports are a great assistance in interesting others in the welfare of your society.

We would not forget music in the program, but whenever practical have a few selections at each meeting.

One of the most enjoyable features of our Noble County society is the basket dinner furnished by the lady members, where all formality is thrown aside and all enjoy the luxuries of the horticulturists' table before proceeding to the literary part of the program.

We have found that usually there is scant time before the noon hour to formally open the meeting, so the time can always be profitably spent in examination of the host's orchards, gardens, etc., and in placing and arranging the exhibit.

The program for the year should be prepared and printed in advance and should contain the date, place of meeting, subject of essay and name of essayist for each month of the year, and also list of officers and all standing committees, and then at each monthly meeting the following order of business should be followed:

1. 10:00 a. m.—Informal inspection of orchards, etc.
2. Placing and arranging exhibit.
3. 11:30 a. m.—Dinner.
4. 1:00 p. m.—Music.
5. Invocation.
6. Reading minutes of previous meeting.
7. Unfinished business.
8. Reports of standing committees.
9. Reports of special committees.
10. Reading essay.
11. Discussion.
12. Miscellaneous business.
13. Adjournment.

DISCUSSION.

Mr. Swaim: I think there is one very important suggestion made in the paper, and that is in regard to reporting the proceedings of these meetings by the local papers. They are glad to get them and publish them, and it brings us before the people. They are aware that there is such a society, and that they are alive and doing business.

Mr. Burton: He spoke of one thing that I think is very important and that is these long drawn out essays. They are the worst things I ever met with. I suggest that we do not put people on the program that know so much that it takes so long to tell it.

A discussion followed on the winter killing of grape vines that were protected.

Mr. Burton: Things go by reverses sometimes, and I do not want Mr. Johnson's faith in covering grape vines shaken. I want to state for the benefit of Mr. Johnson, that my vines that were laid down and covered did not bear any grapes this season. The others bore a fair crop. These

things happen sometimes, and we do not know why. I would suggest that from some peculiarity of the extreme cold, and the fact that the vines were so low on the ground, killed them, while those higher were not killed. In my apple orchard there are some Keiffer pears, and when they got down to the lower places they were killed or seriously injured, and it went so far as to kill in some places Grimes Golden and Rome Beauty.

Mr. Custer: In this connection I will state that I lost about one hundred grape vines this last winter. They were all killed at the roots. The leaves came out early in the spring, and then died. The roots were entirely dead. They were not covered. If the roots had been covered, I think they would not have been killed.

Mr. Garretson: Most of my vines were covered with fodder. None were killed, but I had no grapes. Those left up had lots of grapes.

Mr. Maish: I found that the young green slips were alive, and those that had dropped their foliage were dead.

Mr. Johnson: I have been a great believer in protecting the grape vines. I cover all my grapes, believing they will be better. I want to say that by doing so I have grapes and vines. I usually use leaves because I have so many. I am a great believer in protecting grape vines. I never had one die that was protected.

Mr. Howland: You need not be afraid to follow Mr. Johnson's directions, but I have this to say for the encouragement of lazy people, that I have been growing grapes for forty years, and I never cover them, and have never had a vine killed. I do not even mulch them. The grape growing business is very easy on my place.

Mr. Custer: I want to state further that I train the vines to single stakes. Wherever a stake would blow over, and the vine lay on the ground, that vine was entirely killed by the winter, while those beside them that were on the stakes were all right.

Mr. Thomas: I have always been a strong advocate of protecting the vines. A year ago last summer I did not have many grapes. I had my vines all laid down, but for the first time in years I let them stay on the trellis all winter, and last summer I had a fine crop of grapes. My grapes were not hurt, but the Burbank plum tree was killed by the winter.

Mr. Swaim: Generally we leave our grapes up during the winter. We have but little trouble with winter killing, although we do not raise the more tender varieties. As you who have been attending the State Fair for the last few seasons know, we raise grapes in northern Indiana. Last season the Niagara and some of that class of vines were injured, but I have noticed this in regard to winter killing, that almost universally where

the ground was clean and cultivated late in the fall more trees and vines were lost than by those who were more careless in covering them. The cultivators in Elkhart County suffered severely. Thousands of trees froze. I noticed it in a number of places.

Mr. Kingsbury: I want to speak about the protection of the grape itself. The insects, etc., destroy our grapes as soon as they get ripe, and I have taken to protecting mine with paper sacks. I think it is worth mentioning here, that I sacked a number of bunches of Moore's Early, and to my surprise I found them to be the best grapes I had late in the season.

Mr. Ratliff: It is impossible to grow grapes in our county unless we sack them. We have a little worm that gets into the grape and goes back and forth. It does not seem to affect the color, but they eat the grape. I took grapes from my vines the 2d of November, and they were sweet and nice. It is necessary for us to sack our grapes.

Mr. Jesse Stevens: There are some things about orchards and fruit that we can not control. I do not like to give up the proposition, but I have been forced to from a good many years' experience. I can grow fine bushes, but I can not grow apples. I do not believe we can have any system or laid down rule by which I can produce fine fruit where I live. There are some things we can not control. I have concluded to raise corn and hogs, and swap with other people who can raise fruit.

The next on the program was a paper on the question

IS THE CAROLINA POPLAR A DESIRABLE TREE FOR STREET PLANTING.

W. B. FLICK, LAWRENCE.

In general terms I would say no. I would not myself plant it or advise others to do so for obvious reasons.

The purposes of a shade tree are for ornamentation, for protection from the elements, for sanitation and for aesthetic culture. To meet these purposes a tree should be beautiful in form and foliage, clean, of a dense growth, hardy in both trunk and foliage and of good growth.

The Carolina poplar, from experience and observation, possesses but one of these desirable qualifications. That is rapid growth. It is not beautiful in form or foliage. Its growth is too erect, not making enough breadth of top for shade, and if an attempt be made to shorten in the top it results in a ragged and unshapely tree.

It is easily affected by drought, which causes the leaves to put on a dirty, lustreless appearance and fall from the tree. Many trees in this city during the summer dropped their leaves and afterward resembled giant dead weeds.

The dust of street and chimney adhere to the foliage, giving it a sickly appearance, which subsequent rains do not wholly eradicate as in other cases.

The bloom of the tree that covers the ground in early spring is not a thing of beauty in form or fragrance, but is very repulsive to the sight, often causing nervous people to turn aside from their path.

But the most objectionable characteristic of this tree is that it is short lived. I do not know its average life, but I notice that at the age of eight to ten years the trees begin to decay by showing dead and dying limbs here and there, giving them a most sickly appearance—mere stumps and tufts.

In this city, especially in the newer additions, there are miles of streets lined with Carolina poplars, which in a few years will be dead and unsightly stumps, a nuisance on the street. The planters of these trees and owners of the additions were not planting for posterity. They did not care a snap for posterity. Posterity could take care of itself. They were after hard cash and quick returns. But has posterity no claims on community? Should a great and progressive city like Indianapolis permit such a haphazard work to go on in one of the most potent adjuncts to a beautiful city? Why not extend the powers of the park board so that the direction of street plantings be under a competent head?

Suppose that instead of these Carolina poplars some desirable tree, such as the hard maple, the Norway maple, the elm or some other clean, shapely, long-lived tree be planted, then these streets would become more beautiful from year to year, resembling the matchless boulevards of France or England. Who would be the loser? Surely posterity would remember with respect and kindness the planter. For it is written, "By their works ye shall know them." I would recommend to planters the hard maple, which is a clean, healthy, long-lived tree, having a superb form, dense top, clean and healthy leaves, which withstand severe droughts, are washed clean by the rain, hang on long after frost, and dress themselves in matchless colors before falling.

The elm is a tree of graceful form and foliage, healthy and clean, but susceptible to blight. It is desirable for its tenacity of life under bad treatment, especially in pastures, roadsides and other places where there is much tramping.

However, the oak is the king royal of all shade trees. It, perhaps, possesses all or at least most of the desirable qualities of a shade or street tree. Nor is it as hard to transplant or propagate successfully as is supposed. I have in my grounds now three oaks which I transplanted from the native forest, all of which are showing a wonderful growth.

In conclusion let me say that I have always regarded a tree as a sacred thing, one of the matchless objects of creation, a thing which no man has a right to mar or ruthlessly destroy. Consequently, in my work with them I have tried to do my best in selection for purpose, in planting and care. When a boy the woods was my favorite haunt and when admiring their majestic form I liked to repeat the poet's beautiful lines:

Father, Thy hand hath reared these venerable columns:
Thou didst weave this verdant roof;

* * * * *

Fit shrine for humble worshiper to hold communion with his Maker.

* * * * *

No fantastic carvings show the boast of our vain race
To change the form of Thy fair works. But Thou art here.

* * * * *

Grandeur, strength and grace are here to speak of Thee.

Mr. J. P. Brown: The Secretary requested me to talk on another paper, but as he has placed this question on the program, and knowing its importance, I will ask permission to read a short paper.

IS THE CAROLINA POPLAR A DESIRABLE TREE FOR STREET PLANTING?

Several months ago, observing with regret that very few really valuable trees were being planted in Indiana, but that the great majority of street trees of recent planting were the cottonwood, sold under the name of Carolina Poplar, I so stated in an address before the Hancock County Farmers' Institute on "Parks and City Trees." After giving a list of excellent shade trees, I spoke as follows:

Some years ago a variation of the common cottonwood (*P. monilifera*) was brought to notice, and has been very extensively planted in city streets, parks and lawns. While this tree, commonly known as the Carolina poplar, may have some advantages over the original cottonwood, yet it has all the traits, habits and most characteristics of its brother of the western plains. Both are of quick growth, nice looking while young, but when they become old are rough, ugly, scragly in form and undesirable where other and better trees will grow. The leaves fall very early, leaving the bare, ugly stem at a time when we greatly enjoy the autumn foliage. Even in Denver, Colo., where the list of hardy, successful trees is very short, on account of the arid climate, the cottonwood has been condemned, large trees in avenues having been cut down and other sorts planted.

All the poplars are easily propagated, growing quickly from cuttings and making salable trees much sooner than other trees. But where they

are planted, other good and more valuable trees are neglected, and in a few years those who are induced to plant the Carolina poplar will regret that the elm, maple, sweet gum or some other kind has not been selected. Many diseases and insects infest the cottonwood and Carolina poplar, which will make them short-lived.

I feel compelled to renew this assertion and urge upon the citizens of our State that they carefully consider the character of this tree and cease to plant it in large numbers to the exclusion of valuable trees, a large number of which thrive in Indiana.

It is greatly to be regretted that in a State which was but recently the home of the choicest trees of the American continent, and where almost every natural growth of the temperate regions will thrive, a tree combining all the objectionable features of this tree for shade, and totally without ornament, should be selected for such extensive planting in our village streets, upon the State Fair Grounds and about our school houses.

More than one hundred forest trees are indigenous to Indiana, while one hundred and fifty have been introduced successfully throughout our State.

Far away on our semi-arid plains, along the margin of streams, is found the cottonwood in all its ugliness, a valuable pioneer, it is true, but not possessing foliage sufficient to make a refreshing shade, dropping its leaves at midsummer, infested with borers, covered with galls, and having more enemies, insect, parasitic and fungoid, than any other tree, it is certainly undesirable for shade, shelter or ornament.

I desire to present the opinion of our most noted authorities upon this subject.

Prof. Samuel B. Green, in his "Forestry in Minnesota," classes the cottonwood and Carolina poplar as one—*Populus deltoides*—and says: "As a tree for shade and windbreaks it is not so valuable as the green ash, white willow or box elder. It is subject to leaf rust, is short lived and fails to make a shade dense enough to keep grass out of groves."

In reply to my letter of inquiry, Professor Green writes:

"I certainly am heartily opposed to the planting of Carolina poplar in this section. We have a few of them on our grounds and I can not see that they are much, if any, better than our common cottonwood, and I think that the introduction of this tree under the name of Carolina poplar will lead to many people being disappointed in the planting of them. I hope that you will continue writing about it and discouraging people from planting it. It is certainly greatly to be regretted that so many parks and school grounds have been planted with it. The cottonwood is a short lived tree, and while it might do very well as a pioneer tree here on the prairies, yet the planting of it should be discouraged.

"Yours very truly,

"Samuel B. Green."

Prof. A. C. Apgar, in "Trees of the Northern United States." says the cottonwood and Carolina poplar are identical, and in a letter dated Trenton, N. J., December 21, 1899, writes:

"*Populus monilifera* is the same as *P. deltoides*. This tree is the cottonwood of the West, and a very poor tree for street or lawn planting. I now know much more about the tree than when my book was written, and I know nothing in its favor, but rapid growth.

"Yours truly,

"Austin C. Apgar."

Prof. Frederick V. Coville, Botanist of Department of Agriculture, Washington, D. C., December 14, 1899, wrote me of the Carolina poplar:

"This tree has been known technically under the name *Populus angulata*, but by most botanists this is considered a synonym of *Populus deltoides*.

"I would not advise planting the Carolina poplar as a street tree in case the streets have plenty of open lines such as is afforded by a broad parking and an unpaved roadway."

In letter from Biltmore, N. C., December 19, 1899, Dr. C. A. Schenck, Forester of the Biltmore estate, writes: "As regards the merits of the Carolina poplar as a park or avenue tree, there is only one thing to be said in its favor, namely, that it is easier propagated and transplanted and that it is satisfied with any sort of ground. That it is of short duration, and that it is, from a landscape point of view, not at all what is to be desired, is obvious.

Faithfully,

"C. A. Schenck."

"Nebraska City, December 21, 1899.

"Mr. John P. Brown:

"My Dear Sir—I have yours of the 16th and hasten to say that the cottonwood tree made the settlement of the Missouri Valley possible, but, like the pioneers, they have given way to trees of finer fibres since.

"Yours very truly,

"J. Sterling Morton."

"United States Department of Agriculture, Division of Forestry.

"Washington, D. C., December 22, 1899.

"Mr. John P. Brown:

"Your letter has been referred to this Division. Concerning the use of the Carolina poplar, your general criticism of the exclusive use of this species is commended. I am sorry, indeed, to learn that the tree is so largely used to the exclusion of other more valuable kinds. It is a tree which requires constant pruning to keep it within bounds after it reaches twenty to thirty years of age.

Very truly yours,

"OTTO J. J. LUEBKERT,

"Acting Forester."

"Topeka, Kas., December 18, 1899.

"Mr. John P. Brown:

"I fully endorse what you say relative to the North Carolina poplar. I think I was the first person that brought this tree west of the Mississippi River. I got the cuttings of Dr. Warder, of North Bend. We then thought we had a grand addition to our list of shade trees, it being a sure and rapid grower. As the tree gains in size it increases in ugliness. A large Carolina poplar is a very unsightly tree without a single prepossessing feature. It gets too large and out of proportion for a shade tree, and often is infested with large green worms which denude it of every leaf.

"Yours respectfully,

"D. C. BURSON."

From the fifth report of the United States Entomological Commission, "Insects Injurious to Forest and Shade Trees," by Alpheus S. Packard, M. D., Ph. D. Chapter VI. Insects injurious to the cottonwood. A list is given of twenty-one named insects which infest this tree, a far greater number than attacks other shade trees, while an additional list of 100 insects follows, destructive to the populus family.

Dr. B. T. Galloway, Chief of Division of Vegetable Physiology and Pathology, Agricultural Department, says: "The list of fungi reported as attacking *Populus monilifera* would be an extremely long one." Yet he names eighteen distinct forms of parasites and nine forms of saphrophytes, several of which cause a total defoliation of the trees.

"City of Cincinnati, Board of City Affairs.

"Park Department, December 13, 1899.

"Mr. John P. Brown:

"In reply to your favor of the 11th inst: I entirely agree with you as to the unfitness of the Carolina poplar as a street tree and for profitable planting.

"It is desirable that the general public should understand the truth about the Carolina poplar, to wit, that many nurserymen, having in view their own profit rather than the beauty of streets, private grounds, etc., have recklessly propagated and sold this tree to innocent purchasers because it is so easily and cheaply grown from cuttings.

"I quote from Cincinnati Park report of 1898: 'It is unfortunate that so many Carolina poplars have been set out in the last few years in this vicinity. This tree is only a cottonwood at best, with all the faults of the species. It is very soft and brittle; prone to have borers at work in the heartwood, causing the whole tops or large branches to be broken off in an ordinary storm. The leaves are infested during the summer with poplar worms, which are apt to strip the trees. Admitting that the tree does grow rapidly in many places where other varieties would start but slowly, yet in a few years it begins to decay, because, as stated above, it is only a cottonwood and a very inferior kind of tree.'

"In this connection I notice that the Philadelphia City Forester's list of suitable street trees absolutely excludes the Carolina poplar.

"Respectfully,

"R. H. WARDER,

"Superintendent of Parks."

"Gardens and Grounds, U. S. Department of Agriculture.

"Washington, D. C., December 18, 1893.

"John P. Brown, Esq.:

"After planting many thousands of Carolina poplars in Washington we abandoned them entirely for various reasons. They are of rapid growth and soon become too large and thin, and if cut back the wounds do not heal and water will cause rapid decay. The roots run near the surface and destroy pavements. They will run down and choke up sewers. They drop leaves all summer, after or before July, and in this regard are a nuisance if everything else was right. They are not fit for cities when we have maples and other really good trees.

"We were induced to plant them on account of their rapid growth but early saw our error. We have not set out any for the past sixteen years, or perhaps more.

Yours respectfully,

"WILLIAM SAUNDERS,

"Horticulturist."

DISCUSSION.

Mr. Ratliff: Being one of the park commissioners in Richmond for six years, we planted at least one thousand trees, and not a single Carolina poplar or soft maple. I would not plant either one of these trees. I think more of the soft maple than of the Carolina poplar. We planted more maple, oak, tulip tree, walnut, hackberry, gum and other varieties that grow well there, and they are making fine trees. I want to give my approval to both of those papers. I fully accord with the views expressed and I am sorry to say that along our streets there seems to be no tree so sought after as this.

Professor Troop: The reason I put that subject on the program was that in traveling over the State I find that the Carolina poplar is being planted in cities and towns largely, and I believe that a good many people will be disappointed later on, and so I thought it was time this Society had placed itself on record in regard to it. The opinion here seems to be all one sided. I believe we should condemn this tree as a permanent shade tree. There are localities where it will do all right. It will do all right where quick growth is desired, but I would plant something else at the same time to take its place later on.

Mr. Hobbs: It may be summed up in this, that the Carolina poplar is a temporary tree, and may be planted only with that in view. There is

a place for those trees. They can be recommended for quick growing, but are only temporary. As to the poplar family, my observation and experience goes to show that the Volga is more popular than the Carolina. If I were planting a poplar I would prefer the Volga.

Mr. Henby: The President spoke of the Volga poplar and intimated that it would make a good substitute for the Carolina. I bear him out in that suggestion. It is much smoother, is very dense in foliage and retains it as late in the fall as any tree we have. The foliage is much like the hard maple in the fall. It hangs on late until we have hard frosts. By proper care it forms a very fine top. I think it is much more desirable than the Carolina poplar, and much longer lived.

Mr. Ogg: I would like to hear something about the catalpa, especially as to its durability.

Mr. Teas: I want to give the Volga poplar a tip before it is passed. It somewhat resembles the Lombardy poplar, but is longer lived. The Mennonites brought it from Russia to Minnesota.

Mr. Cotton: In answer to the question of the catalpa, Governor Williams said he considered them a little better than stones for gate posts, because stones would break sometimes.

Mr. Brown: This catalpa question will take longer time than we can give to get an intelligent idea, and if the gentleman will give me his address, I will send him documents that will give him satisfaction.

Mr. Maish: I can not see the objection to planting the Carolina poplar where we want thick shade, but we should plant other trees interspersed among them. If I were laying out a new part of town expecting to get rid of it soon, I would plant Carolina poplar; but if I were making a home I would plant something between to be permanent.

Mr. Swaim: Another point to be gained by these quick growing trees interspersed with the more permanent ones is, that almost always the street trees are planted too close together, and by inducing them to plant Carolina poplars between them, they can take out some trees, and then they will be about the right distance apart.

The following paper was read by Mr. John P. Brown, Connersville, on "Park and City Trees."

PARK AND CITY TREES.

JOHN P. BROWN, CONNERSVILLE.

As it requires several years for a tree to grow large enough to afford shade and attain that beauty and symmetry which is so prized in an ornamental tree, more than ordinary care should be used in selecting such species and varieties as will be satisfactory.

Our city streets are so paved with brick, concrete and asphalt that but little moisture and air can reach the roots of street trees, while the continual excavations for gas, water and sewerage pipes and drains often destroy the principal roots of the trees and kill them.

Escaping gas—especially natural gas—is fatal to many of our best street trees, and how we may succeed in having shade in our city streets is becoming a serious problem.

Less than half a century ago Euclid Avenue, in Cleveland, O., was recognized throughout Europe and America as having the most magnificent street of shade trees in any city of this civilized world. The distinction which Cleveland attained by its many fine avenues of trees gave it the name Forest City. But architectural pride and street improvements have wrought havoc among the trees which secured for it such pre-eminence.

In planting trees in the city streets, especially where cuts and fills have been made in grading, the first requisite is to have sufficient good, rich soil to support trees for several years. In Washington City several cart loads of earth are excavated in poor ground and soil of better quality brought to take its place. Too often a hole is dug that will just take in the stubs of the roots which are all that remain of the originally well-rooted tree, and when it starts to grow the young rootlets have no mellow earth on which to feed.

The hole for any tree that is three years old or upward should never be less than three square feet and two feet in depth, and should contain only soil of good quality. Success can not be expected without good and ample roots. Nursery-grown trees are superior to those of natural growth. With the latter it is possible to secure but a small portion of the roots, and in digging these are usually mutilated. Transplanting very large trees is seldom advisable, always the proportion of trunk and root is destroyed, all the top, with its millions of buds and leaves, is left to evaporate moisture and sap the life of the newly planted tree, which has a very small portion of the roots in any case, even when a ball of earth is removed. A tree three or four years old, well rooted, with a top trimmed back to balance the roots, is far the best in the long run.

KINDS OF TREES.

Elms are desirable at all times, only are not quite as rapid growers as maples, yet they succeed well, grow finely if in good soil and are watered during the first year or two. To be of the best service they should not be planted too closely—two rods apart, or even forty feet is close enough. A quick shade may be secured by placing some rapid-growing trees between. Soft maples answer well for this purpose.

The sweet gum (*Liquidambar*) is one of our most beautiful trees, native to American forests, hardy throughout Indiana, easily transplanted and of rapid growth. The leaves, handsome at all times, are especially so in autumn, as they change to shades of crimson, remaining long on the trees. It is questionable if America possesses a finer tree for shade for either park or street planting.

Ash trees are desirable for park purposes, but are not so suitable for street planting. Where the direct rays of the sun beat on the unprotected trunk of these trees it injures the bark and makes it easy for borers to find lodgment. The same may be said of many other trees that are subject to the attacks of these insects. The eggs are deposited in the bark of very many trees, but if the tree be in full vigor the worms seldom injure it. Only when the health of a tree is impaired, as by the sun, scale, or soon after it has been transplanted, and has not recovered from the shock, is it usually destroyed by borers.

The catalpa, while of great value as a forest tree, and useful in clumps in parks, is unsuited for street planting. The leaves are so large and heavy as to pull the leading shoot aside, while young and tender, and hence a crooked, irregular and ugly growth. This is overcome by close planting in parks, as the trunk is then forced into an upright growth. Where catalpas have already been planted on street lines, it would be well to plant an occasional elm, or other tree, which in future will take the place of the catalpa.

Our American basswood is frequently planted in city and village streets, and is well adapted for such uses, but it suffers from borers as the ash tree does.

Boxing the trunks, thus shutting the bark from the sun's hot rays, is of great advantage, besides protecting the trees from animals.

The sugar maple, although of slow growth, should not be omitted in any list of good trees. It is so well known in Indiana as to need neither description or commendation.

Our swamp maples, both the scarlet and white, are excellent. I prefer the scarlet as a finer tree, more durable and superior for permanent street or lawn planting. These trees should be got from a nursery, should have good roots and should not be planted too deeply.

A rare tree in street planting is the larch, yet it is the most beautiful and easily grown. The leaves fall late in autumn, yet its appearance

is that of an evergreen—tall, upright in habit, with clean, bright foliage like the pine, very attractive, and by no means slow in growth. The European larch is superior to our American variety, and should be the kind chosen.

FOR PARK PURPOSES.

For park purposes, a small amount of money will buy a large number of trees of small size—say three to five feet high—of all kinds of trees. These will be well rooted and in every way superior to larger and more costly specimens, and in a dozen years will be larger, finer and much better than the large trees would be.

The magnificent forest tree of Indiana, the yellow poplar, makes an excellent street, lawn or park tree, but is difficult to transplant when large. To succeed with this tree, the tulip tree (*Liriodendron*), it is absolutely essential that great care be used in transplanting, and that a small size be used.

The populus family has a large relationship, all of which are used to a considerable extent. The Abele, or silver poplar (*P. alba*) is that well known silver foliage tree which “suckers” so persistently, often seen in city streets, where none other will thrive. It stands all sorts of abuse—paving of streets, tramping by stock and excavations for pipe-laying. It makes a grand shade, and in Europe it is used for lumber, which is quite valuable, and but for its suckering habit would be greatly admired everywhere. The Lombardy poplar is also familiar to all, being of tall, slender growth, but casting very slight shade.

It seems to thrive in some cities where street improvements have destroyed all other trees. The aspen (*P. tremuloides*) is a common forest tree in northern regions, and is useful to give diversity in park planting. The Balm of Gilead is one of the best of the poplars.

REPORT OF THE COMMITTEE ON EXPERIMENTAL ORCHARD.

PROF. J. TROOP.

The following committee was appointed to have charge of the experimental orchard and in getting it started. It consists of the President, Mr. D. F. Maish, and myself. We were instructed to advertise for sites for the orchard, which we did. I sent out advertisements and had them printed in one paper in every county in the State.

We received a number of communications from different ones who had just the right site to dispose of, as they thought, but in every case

the price was rather high and in most cases the situation was not suitable. You remember that we had to take into consideration the fact that we had not only to purchase the ground but we had to supply some one to take charge of those grounds, and if we secured a location off from the railway somewhere, or in some place where we had no members, it would be necessary to secure the services of a competent man and pay him accordingly. The committee held a meeting last spring, and after taking into consideration all these letters, we decided that the spot where we located in Lawrence County was an ideal spot for the experimental orchard. Not only was the location of the orchard in the apple belt, but being right near Mr. Burton's place we were able to secure him to take charge of this ground at a very moderate cost; in fact at no expense to speak of. The advertisement was made according to the instructions of the Society, and we have the orchard started. It will now be necessary to appoint a new committee to have charge of this work in the future. The land is paid for and the Society has a deed for it. We have been criticised for favoring southern Indiana. We could only locate it in one spot. My idea is that, when the Society gets on its feet later on, we ought to have one in the northern part of the State, as the conditions are different there. I hope this is only a starter which will bring great good to the fruit interests of the State in the near future.

The committee met in February, and after duly considering the various offers for sites, the Secretary was instructed to send the following reply to the communications:

Lafayette, Ind., February 4, 1899.

Dear Sir—In response to your letter of recent date concerning land for an experimental orchard, I will now report that the committee having the matter in charge has just had a meeting, and after considering the matter carefully from every standpoint, have decided to accept an offer of a tract of land situated in Lawrence County.

In making their decision the committee had in mind the fact that this movement is for the purpose of developing the fruit interests of the entire State, and while soil and climatic conditions enter largely into the problems to be solved, there are other factors which play an important part and which could not be lost sight of.

Trusting, therefore, that this explanation will be satisfactory to all concerned, and that this movement will eventually result in great good to the fruit interests of Indiana, I am,

Very truly yours,

JAS. TROOP,

Secretary I. H. S.

The report of the committee was accepted.

It was moved and carried that the present committee be continued.

The Committee on the President's Address made the following report, which was adopted:

To the Members of the Indiana Horticultural Society—Your committee, to whom was referred the President's address, have carefully considered the different recommendations and suggestions made by him, and we heartily endorse the same. We especially and emphatically endorse his suggestions as to nature study in our public schools, and would recommend that our legislative committee urge this matter upon our next legislative assembly. We would also call particular attention to his suggestion respecting the preparation of a map of the horticultural districts of Indiana, with a list of the varieties of fruit which are grown successfully in each, and would recommend that the Secretary of this Society be authorized to prepare such a map to be included in the report of this Society for 1900. We would also recommend that the same be printed in bulletin form for general distribution.

Respectfully submitted,

L. B. CUSTER,

H. F. McMAHAN,

H. H. SWAIM,

Committee.

The Finance Committee also reported as follows:

To Indiana Horticultural Society — The undersigned committee on finance beg leave to report that we have examined the accounts and vouchers of the Secretary and Treasurer and find them correct.

JOSEPH C. RATLIFF,

J. K. HENBY.

THURSDAY AFTERNOON.

The first paper of the afternoon was presented by Prof. Amos W. Butler, Secretary of the Board of State Charities, on "The Value of Horticulture to Our Public Institutions," and the discussion of the paper was led by Prof. T. J. Charlton, Superintendent of the Reform School for Boys, at Plainfield.

THE VALUE OF HORTICULTURE TO OUR PUBLIC INSTITUTIONS.

AMOS W. BUTLER, SECRETARY BOARD OF STATE CHARITIES.

The value of horticulture to our public institutions is not generally recognized. Those of a local character do not appreciate what this might

be to them. The management of some of our State institutions has recognized the utility of this form of industry and has, to a greater or less extent, profited by it. For one reason or another, others have not been able to take advantage of this. Unfortunately, the lack of ground prevents some from deriving the advantage they might otherwise obtain from horticultural pursuits. A far greater proportion of the local institutions, such as poor asylums, orphan homes, etc., do not obtain the benefit they should from this source. Some of the latter are not favored with ground for tillage. Many of the poor asylums are located on very inferior land. Often, I am assured, it is the poorest land in the county, and the intimation has sometimes been given that the place was bought through jobbery. These are, in every sense, "poor farms."

The possibilities to be derived by our institutions from the orchard and garden are many. Among the purposes of such pursuits may be mentioned the following:

First—Means of education.

Second—Preparation for an occupation.

Third—Means of treatment.

Fourth—Healthful, outdoor life.

Fifth—Value of the products.

Educational Value: As in other lines, some of our institutions, such as the School for Feeble-Minded Youth at Fort Wayne, have led the way in utilizing the growing of fruits, flowers and vegetables as a means of instruction. With the awakening of the germ comes a response from the mind; with the unfolding of the leaf is observed the awakening of interest. This is true of the normal child; and likewise is observed, though in a lesser degree, in the child of weaker mind. It is a pleasure alike to all.

It was my pleasure a few months ago to visit the Boys' Farm School on Thompson's Island in Boston Harbor. This school receives orphan boys from Boston and vicinity, and among other things they are taught farming. The individual ownership of a tract of ground for gardening is recognized in one way or another. The George Junior Republic at Freeville, N. Y., is another institution upon a somewhat similar plan. In each of these there is an attempt to work out the educational problem along natural lines. The children participate, to some extent, in the government of the institution and the control of its inmates, but in a different way in each.

In the social experiment being tried by the National Cash Register Company at Dayton, Ohio, the one thing that impressed me most is that it encourages each of the children of its employes to cultivate his own garden. Seeds are supplied by the firm, instruction given, methods watched, industry noted, and prizes are awarded the most successful gardener. Lesser rewards are bestowed on those who do nearly so well. Each receives what he grows, and those declared winners also get the prizes. Some schools have established children's gardens. A suitable tract

of ground is procured, the children prepare the soil, plant the seeds, water the ground and tend the plants. They study the seed, the plant, the flower, the effect of sunshine and shade, of moisture and heat. These child gardens are a feature in the public schools at Washington, D. C., and elsewhere. This is to become a factor in our education. It is well worth the consideration of those in charge of our orphans' homes.

Preparation for an Occupation.—I desire to speak of this subject in the same sense in which a trade school teaches a trade. I sometimes feel impressed with the fact that many children leave the farm because they are not taught the principles or trained in the correct methods of farming. Few, indeed, are the farmers who can give instruction to their children so as to interest them and hold them to the wholesome farm life.

All of our States have established agricultural colleges, yet how few young people there are who avail themselves of the course in agriculture. Minnesota has established an agricultural school. Children are eligible to admission to it when they have completed the eighth grade in the public school—that is, when they are ready for the high school; when they have reached the age of from 13 to 15 years. This is the period when most children drop out of school. In this institution, they are taught the elements of farming by lecture and practice. They study objects and methods in the laboratory and in the garden and field. They are taught and trained. Their eyes are opened. They begin to see the reason for things. They become interested. I have been much impressed with what I have heard concerning this school. Last year, I am informed, there were about 360 pupils, sixty of them girls. The story that comes to me is that these young people go to their farm homes at the close of school eager to apply the knowledge gained. When they return in the fall they bear testimony of the pleasure derived from farm life the past summer, because of the opened eyes, the awakened ears, the new understanding. They tell of the different interest they had in everything about the farm during vacation.

I confess I was very much impressed with the wisdom of Governor Mount's recommendation to the last Legislature—that a law be enacted providing for instruction in agriculture in the public schools. I believe that this is practical and is one of the notable advances yet to be made.

There are certain of our public institutions, the intention of which is to fit children for lives in family homes or prepare them to make their own way—to become self-respecting and respectable citizens. The rule is that farm homes are more desirable than others; and the fact is that very much the larger part of our dependent children go into farmers' families. In those who are old enough were taught in the best way possible what they are capable of learning of gardening, fruit growing and the elements of farming, would they not be more useful in these homes and be better equipped when they undertake to make their own way?

At the Reform School for Boys at Plainfield, much has been done to give the boys some instruction in this work, as well as to teach them

trades. At the Soldiers' and Sailors' Orphans' Home at Knightstown, one of the best things taught is the trade of florist. Training in horticulture may be a much more useful thing to our orphans' homes than it is. The results would be satisfactory, and besides the children would the more readily commend themselves to good farm homes. Some of the orphans' homes do something in this line. Others, it is to be regretted, have not the land to make such training possible. Still others do not make the effort they should in this direction.

A Means of Treatment.—It is found that outdoor work, such as is to be had among fruits and flowers, in a garden and on the lawn, is very helpful in the treatment of certain classes of cases in insane hospitals. This fact is recognized by all institutions of this kind in our State, and so far as is possible, inmates are given the benefit of such occupation. By it the mind is occupied and the body given proper exercise.

One of the most interesting institutions I have ever visited is the village for epileptics known as "Craig Colony," at Sonyea, New York. It is founded after the general plan of the noted Bielefeld Village for Epileptics in the Province of Westphalia, Germany. The latter institution has now been in active operation for a third of a century. At Craig Colony there are 316 inmates affected with the terrible disease, epilepsy. They live out of doors as much as they can and do much of the farming and gardening. The experience at this institution is that those patients who work out of doors improve much faster than those who work indoors; and further, it is considered that agricultural work is best for them. Next to the classification of inmates the greatest emphasis is laid upon their occupation. The Superintendent, Dr. Spratling, says: "Labor is of the most beneficial and remedial value for the patient, and as a medicine, I prescribe it. Outdoor life for the epileptic is best. The epileptic should be able to provide, by his own labor, as much as possible of the future supplies he will require to consume; and when we remember it is to his interest to eat largely of cereals, breadstuffs, milk, eggs, etc., we will readily understand the value of having good farm lands to begin with."

Healthful Outdoor Life.—The erection of large asylums for the chronic insane is not now considered the wisest thing. The results therein have not proven satisfactory. The herding of men in large institutions in too great numbers is recognized as undesirable. In consequence, the best experience dictates the care of the chronic insane in quite small institutions or in colonies, under the supervision and management of a neighboring insane hospital. The latter plan seems to commend itself to most experts. In addition to the cheapness of the building and the advantage of a small number of inmates, there is an opportunity for every able-bodied, harmless person to labor outdoors. Farm work, the growing of fruits and flowers, the garden, the live stock, all these keep occupied both mind and body.

That which attracts out attention most is the fact that both for the

children in the orphans' homes and the inmates in the poor asylums some exercise is necessary. Nothing is so good as outdoor life. The superintendent of the poor asylum should provide work according to the ability of each person. I sometimes say that the ideal superintendent is he who can provide some work for each inmate to do, something for each one, man or woman, according to ability. In too many poor asylums there are a number who do not work. Only those who do so willingly are given occupation. The superintendent often gives expression to his feeling that it is too much trouble to get any work out of them. He says he would rather do the work himself than bother with the inmates. Such a man, as a superintendent, is a failure. The inmates have beaten him. They live in idleness, with no thought of return for the help given them by the public. Usually, in such a place, there are several to be found who, if they had to work, would go elsewhere; and the people would, in consequence, be relieved of that much burden. One occasionally finds that where a new superintendent has assumed charge, by reason of the inmates being required to perform such duties as they can, many of those formerly there have left rather than give up the old habit of not working. In some such institutions, the superintendent finds work for all. Work is provided for the one who can labor an hour, as well as for the one who can render ten hours' service. There are but few among the inmates of a poor asylum who can follow the plow all day or be relied upon for ordinary farm work; but there are many who can care for the garden and orchard and lawn. In one poor asylum the best gardener had a stiff back. He could handle a hoe, but could not stoop over. He did his work well and directed others in theirs. In another similar institution I found a man without legs, walking on two wooden pegs, with the aid of a cane, but directing a dozen other inmates, who graded from lazy through feeble-mindedness to old age, bugging potatoes. Thus the work of gardening, gathering and preparing vegetables, of trimming and cultivating vines, of picking berries and of caring for the door yards can well be done by many poor asylum inmates. Thereby, they may have the benefit of healthful exercise and an abundance of wholesome food of their own growing.

Value of Products.—The financial statements of poor asylums show that the institutions range from those that are self-supporting to others in which it costs over and above the value of the farm products about \$100 to support each inmate per year. But it must be said that it is not usually the case that in those that are nearest self-supporting the inmates fare the best or the buildings and other property receive the best care. By way of illustration, the following references are taken from among the better administered poor asylums. Each of them had ample garden and orchard products in season. In addition, last year there was put up for the inmates in the Wayne County Poor Asylum 1,000 cans of fruit. The past year there were no raspberries or cherries, but over 500 cans of fruit were put away, in addition to an ample supply of vegetables. In

the Marshall County Poor Asylum the past year there were seven acres in garden, five acres in orchard and a large patch of small fruits. There was preserved for winter 110 gallons of apple butter, 650 quarts of fruit, besides an ample supply of apples, potatoes and other vegetables. In Kosciusko County the poor asylum has four and one-half acres in garden, one acre in small fruits, six and one-half acres in orchard, four of which is bearing. At this institution there were put up 1,300 quarts of fruits, 125 gallons of apple butter, 100 gallons of pickles, besides quantities of apples and winter vegetables. On the poor farm in Madison County there is a garden of ten acres, two of which were in beans the past year. There is an orchard of six acres and an acre of small fruits. There are grown gooseberries, currants, blackberries, strawberries, grapes, and also rhubarb and flowers. This institution put up 1,000 quarts of fruit, 500 quarts of tomatoes, 100 quarts of catsup and chili, besides jelly, jams and grape butter. The day I was there they were making kraut.

It is extremely desirable that more attention be given to horticulture at our poor asylums and orphan homes. The result will be, under good management, improved discipline, occupation for the inmates, an abundance of healthful food and a material reduction in the cost of maintenance. Our State benevolent and penal institutions have taken the lead in this matter. They are profiting thereby. To no one of them, perhaps, do all of the advantages of horticulture herein mentioned accrue so much as to the School for Feeble-Minded Youth. Yet each is greatly benefited by what it does and derives profit, to a greater or less degree, by its efforts.

The institutions at Indianapolis have a limited amount of land; the Institution for the Blind almost none at all. The Industrial School for Girls and Woman's Prison has a good garden, as does the Institution for the Education of the Deaf. The Central Hospital for the Insane has 153 acres of land and tills about forty acres of garden. The Indiana Reformatory at Jeffersonville has but a garden adjoining the institution. However, for the past two years it has rented a farm of about 200 acres without the city, which has been worked by a force of the more trusty inmates. The State Prison at Michigan City has a number of acres of sandy soil upon which certain vegetables grow. The former warden, Mr. Harley, conceived the idea of leasing 100 acres of swamp land adjoining this, draining it and growing garden stuff for the institution. The experiment was successful, and aside from employing about sixty-five men throughout the warmer months of the year, a very large quantity of vegetables was grown. On this new land was planted, approximately, twenty acres to potatoes, five acres to peas, five acres to corn, onions ten acres, cabbage twelve acres, besides large patches of carrots, cucumbers, parsnips, turnips and celery. Of some of these crops there was a fine yield, there being 2,000 bushels of fine onions, 65,000 heads of cabbage, 1,000 bushels of carrots, 1,000 bushels of parsnips and 300 bushels of winter radishes; besides which, the institution put up 3,500 cans of tomatoes and 100 barrels

of pickles. The quantity grown was greater than the prison needed, and Warden Shideler generously offered to share the surplus with other State institutions needing such products. Two or three car loads of cabbage and several hundred bushels of onions were supplied other institutions. The State Soldiers' Home has no land under cultivation. Those in charge are establishing, in the delightful seclusion of a native forest, a comfortable home with beautiful grounds, made attractive by flowers and shrubbery. The School for Feeble-Minded Youth has 305 acres of land, fifty-five acres at the school and 250 acres in the farm one and one-half miles away. It also rents ninety-three acres. On these tracts are growing all kinds of fruit trees and the more desirable small fruits. Large areas are planted to garden each year, in addition to that given over to regular farming. This has been quite a factor in reducing the cost of maintenance, and it is confidently believed that in the near future inmates can be maintained as cheaply here as in the better conducted poor asylums. The farm at the Reform School for Boys consists of 400 acres. With the exception of the creek bottom, about sixty acres, this is stiff clay land. The former is devoted to gardening and the latter to fruit growing and general farming. Two hundred and sixty-four acres are tillable. By means of its farm this institution shows the lowest per capita cost of maintenance of any of the State institutions. The Soldiers' and Sailors' Orphans' Home at Knightstown has a farm of 247 acres of clay upland. This is principally used for general farming, though considerable quantities of vegetables are raised and some fruits are grown. One hundred and seventy-two acres are under cultivation. The Southern Hospital for the Insane at Evansville is located upon 160 acres of land, seventy-five of which are under cultivation. In addition to an old orchard on the farm, many young fruit trees have been planted and quantities of small fruits and grapes are grown. The remainder of the ground, except that necessary for buildings and lawn, is planted to vegetables. In the efforts to solve the difficult problem of sewage disposal, a precipitation and filtration plant was put in. The past summer it was arranged to utilize the water from this to irrigate the garden. The Northern Hospital for the Insane at Logansport has 300 acres, of which 112 are tillable. Quite a tract of this is in bottom land, which is planted to garden. An irrigating plant is arranged to utilize the sewage from the institution upon this low land. Elsewhere upon the farm are large tracts of fruit. The Eastern Hospital for the Insane at Richmond is located upon a farm of 307 acres, 190 acres of which are under cultivation and ten acres more are tillable. A part of this is creek bottom, which is set apart for garden. An excellent young orchard is just coming into bearing and many small fruits are grown. One of the most valuable settings promises to be an extensive vineyard east of the institution. Much of the land is devoted to general farming. The lawns have been planted with trees and shrubbery and in summer are bright with attractive flowers. All of these institutions, however, grow flowers in quan-

tities. Aside from affording work for the inmates and making the grounds more attractive they are of service in decorating the rooms and bringing brightness and cheer to those confined indoors.

The success of our State institutions in advancing all lines of horticulture is a source of much satisfaction. Our other institutions, particularly the local ones, could profit thereby. Each of us can do his part to bring to their attention the valuable results that can be attained by giving more attention to this line of work.

DISCUSSION.

Prof. T. J. Charlton: Mr. Butler has truly said what is generally recognized. I did not appreciate the value of horticulture when I took charge of the Reform School a few years ago. I now believe that horticulture, and everything connected with it, is necessary to our institution. It is not a luxury. In Plainfield we have an orchard of twenty-two acres. We get more pleasure and profit from that than any other part of the farm. We now have about five acres of strawberries. That pays better than anything else. From the vineyard we get several tons of grapes. The boys have all they can eat, and they never had better health than during the grape season. Our poor asylum now has fine crops of strawberries on ground that brought nothing before. As for teaching the science of horticulture, it is done with satisfactory results. In Ohio they are noted for their advancement in this direction. There is no home in the world that will do as much good as a farmer's home. Our boys are more in demand among the farmers, and are more successful there. I believe the State institutions should have everything in this line. They can do a great deal of good to the farmers in that locality. I am a very strong believer in giving the inmates out-of-door employment.

Mr. Johnson: I am in full accord with the address, and to prove that I am, I want to say that Mr. Kingsbury and I have conceived a plan that we expect to carry out in the spring right along this line. We have a piece of ground, and we are going to break it up this winter, and the children have heard of the idea and are enthusiastic about it. We are going to furnish them with seed and implements, and put them to work in the garden. They are very much pleased with it.

Mr. Kingsbury: Last summer we gave them seeds and plants, and it was amusing to hear the little fellows tell how high Johnnie's plants had grown, and how many blossoms there were on some of the other plants. Each was interested in what the other was doing, and vying with each other as to who would make the best show. They take very great interest in this work. I can readily see that it is one of the best things to be done, to have gardens in connection with the State institutions.

Following this was a paper on

WHAT CAN WE DO TOWARDS CREATING A BETTER SENTIMENT
CONCERNING THE IMPROVEMENT OF OUR
RURAL SCHOOL GROUNDS?

SUPT. LAWRENCE TURNAN, ANDERSON.

I am quite conscious of the fact that to the majority this subject seems flat. It is so old, so commonplace and yet so far from apparent personal interest that a discussion of the subject is met with a sigh of grief and passed with one of relief.

I have yet for the first time to listen to a conversation on any line that pertains to better care of school grounds, save by school officials. More attention is paid to the hostler and horses than to the teacher and children. It is very obvious to one in touch with rural schools that the surroundings suffer neglect because of a lack of separate individual interest.

There is too much "if-the-others-will-help-I-shall" or "I'll-do-as-much-as-the-rest" spirit in the neighborhood. The neglect certainly can not arise from a feeling that every possible thing external has been done to make the boy's school life a sweet remembrance to his manhood and to make the ground a model of beauty to which the community can look with just pride. The following objections to the present condition of the majority of school grounds are very clearly seen: Many yards are too small for the children to play as they desire; they are cramped and hampered very often within a half acre in which the house occupies a large space. When the boys give vent to their condensed energy and jump the fence some patron becomes angry because his fence is broken or his grain is trampled. I know of a citizen who owns large tracts of land all around a half-acre school lot and yet he frowns and scolds severely when the children trespass. This individual wishes to drive the school out of his community. He does not allow trespassing and will not sell more ground that the children may have ample room in which to play. However, such men are few, and thanks for it.

Many lots are low and poorly drained and during the rainy season of the year they are wet, muddy, uninviting and unhealthful. The children can not play with any pleasure unless they take pleasure in besmattering themselves and the house with mud while wielding the shinney club.

A teacher said not long since that his school yard was so muddy that he must get some gravel walks or he would be compelled to carry the small children over the ground to give them fresh air and exercise.

The grounds should be spacious, well drained and if possible, high and beautifully located. No school lot should consist of less than one and one-half acres; one-half acre of this should grow beautiful trees, grass,

flowers, vines, etc.; the remaining acre, which might be back of the house, should be free from all obstruction to games and gymnastic exercises, and should be carefully prepared for the physical development of the child.

In Germany, a convention of German physicians and scientists have made the following suggestions concerning school grounds: The school grounds must be in an open place where light and air are good, removed from the noise of the street, dry and well drained and, where possible, on elevated ground and supplied with good water. They must be large enough to afford three square metres space to each child, besides the space occupied by the buildings. The play ground should be covered with gravel; cement walks should lead to the main entrance.

It will be remembered, however, that we Americans have more room than the Germans and our school boys and girls make their demand accordingly.

This question of "school grounds" is one that will admit of more work than words, and one in which the "whats" are more conspicuous than the "hows," and yet I am to try to show how a better sentiment for good school grounds can be created. I believe the key to this solution is through the school officials and teachers.

Upon the request of the county superintendents and township trustees the teachers will endeavor to get the pupils and patrons interested. No other plan seems effectual. A certain day in October each year is designated by the Governor as Arbor Day. A suggestive program is given to each teacher by the State Superintendent, and if it is followed skillfully the teacher may entertain the patrons and interest them in the care of the school grounds.

In my county, Madison, the teachers observe Arbor Day almost without exception, and a large number of trees are planted. This last October there were planted in our county 600 trees. A large number of the new trees die each year, but the lesson is not lost, even if all the trees should die. The trustees are requested to make gravel walks, which they have done in a number of instances. Thus we are slowly striving to have beautiful school grounds and, though it may be far in the future, when the ideal is reached, the seeds that the teachers and school officers are now sowing shall one day bear fruit.

DISCUSSION.

Mr. Hobbs: This is a most excellent paper, and I hope it will bear fruit in the future. The work we are now setting on foot may result in a few years in the improvement of the school grounds of the State.

Professor Troop: This is an excellent paper, and I think it ought to be discussed freely. If many of you had traveled over the State as much as I have in the last year, and observed the rural school grounds and their condition, I am sure you would think that this is a question that deserves

the attention of some one. I do not know of any work that this Society can engage in that will bring better results than to take up the question of the improvement of our rural school grounds. You can find all over the State excellent school buildings. I have in mind now one county in which I did not see a poor school building, but the school grounds that were planted with trees and shrubs were an exception. The authorities seem to have the idea that when they build a schoolhouse their work is done. I think there is a broad field for work along horticultural lines. Last summer we offered premiums for the photographs of the "best cared for and best laid out school grounds." There was but one set of photos exhibited. We did not offer any premiums this time, because we thought the time was not ripe for it. But I think it is time something should be done along this line to create a sentiment toward beautifying our school grounds.

Mr. Henby, of Greenfield: If the gentleman who just spoke will spend a little more time in our city, and in our township, we will convince him that at least there is one city and one township that is making an effort to carry out the suggestions made by the gentleman in the paper just read. We can show him some very fine school grounds. That is, compared with the average school yards in the State. We will show him fine walks and trees that have been planted by the children. As has well been said in the paper, this work must be begun with the school officers and teachers. The greatest difficulty we have had is to get the teachers interested in planting trees in the school yards. It is a common complaint that the teacher is already overloaded with work. They have more to do than they can carry out. However, that does not necessarily deprive them from taking a few hours on Arbor Day in going through the ceremonies as prescribed by our State school officers, and planting a few trees, and we are encouraging it in our county. It is certainly a very important subject, and should be more interesting than it is. There is a sentiment now going around the State for concentrating schools, and when we get that, then we will be better prepared to carry out this idea.

Mr. Hobbs: It is a matter of pride to me that those school grounds which took the premium at the summer meeting are grounds that I helped to beautify with my own hands when a boy.

Mr. Kingsbury: It seems to me that if this Society will continue to give premiums for the best ornamented school grounds, we can use that fact as an inducement to the Legislature to renew their appropriation. That is doing something for the benefit of all. I think the Legislature thinks this is a selfish organization, but if we are doing something of this kind, and benefiting the State in general, I think it would be a strong inducement to them to give us the appropriation.

Mr. Clore: I agree with Professor Troop, that taking it all over the

country our rural school grounds are a disgrace to Indiana. To my knowledge I do not know of any school buildings and premises that are in any way beautiful, except those in the cities and villages. The majority of our State officers seem to think the city schools are the only ones that need fixing up. I have seen school yards so muddy that the patrons would drive right up to the door to get the children into the vehicles. In regard to the premiums for the best school yards, I think it would be best to place the awarding of those premiums at some future date, say three or five years.

Mr. Hobbs: The plan is to show an appreciation of what has already been done, by offering premiums now on the best school grounds at this time; if we continue these premiums, those who are now beautifying their school grounds will get the benefit from it later.

Mr. Ogg: It strikes me that the premiums ought to be classified. It will be borne in mind that our school organizations are of two distinct characters. In towns they are different from those in the country. What has been done is usually in the smaller cities. We should encourage our rural districts to beautify their school grounds. I urged an appropriation of \$500 or \$1,000 to be used by the superintendent of our county asylum for the purpose of gardening and tree planting. It was favorably received, but it had to be adopted by a unanimous vote, and therefore failed.

Mr. Morehouse: I wish to say that I heartily indorse the sentiments expressed by the gentleman's paper. Professor Troop has said that something ought to be done in reference to the country school grounds. What is it that should be done? Reference has been made to the township trustees. Who control those school grounds? There is still something behind this that the township trustees can not control. The grounds on which most of our schoolhouses stand were purchased or leased many-years ago when the buildings were surrounded by forests. The ground then thought necessary for a school building was about one-fourth acre. The situation of a school building on a corner lot of one-fourth acre precludes the possibility of beautifying the grounds. There is not room enough. How can we get more ground? I know of one instance where an old schoolhouse stood on a corner lot of less than one-fourth acre, and the parties refused to sell more. A new building was to be put up, and the land went from one man to the hands of two who were willing to sell for a good sum. They wanted for a half acre about sixty dollars, and they received it from the township trustee in order to make it three-fourths acre. We may have to ask the Legislature to legislate on this matter so that the school buildings and lands may be beautified.

Mr. Maish: I feel that the question of the neglect of the country school grounds has been somewhat overdrawn. I think we fail to notice the fact that our country schools do not begin in the fall until the leaves

begin to fall, and close in the spring before the leaves come on, and unless we use evergreens there is not much to be gained by landscape ornamentation. There is not much improvement to be made on blue grass. Unless some way can be provided for more ground, I think very little tree planting would be practicable in the country school grounds. Generally we have a nice spot selected for the school grounds, and after the schoolhouse has been erected there is generally a nice set of blue grass sod.

W. W. Stevens: The Agricultural Society is very anxious to co-operate with the State Horticultural Society in order that everything may be up to date, and I would like to make a request of the Society at this time, so you can take action and report before the Society adjourns. The matter is this: We would like to have the premium list revised, so far as relates to horticultural matters, and in behalf of the State Board of Agriculture I will ask this Society to appoint a committee to revise this list.

Moved and carried that the chair appoint the committee.

Messrs. Sylvester Johnson, Swaim and Kimmell were appointed.

SOME GOOD TREES FOR SCHOOL GROUNDS.

J. P. BROWN, CONNERSVILLE.

Were I to counsel as a landscape gardener, how to arrange and plant a tract of considerable magnitude, my advice would be very different from what I shall here suggest for the limited area of a school lot.

The forbidding appearance of many school grounds has much to do with making children careless of their surroundings, and this habit does not cease with childhood or school days.

The love of flowers, admiration of trees and interest in forests should be inculcated not by a spasmodic effort on Arbor Day, with a sentimental effusion, meaningless and soon forgot, but by frequent reference to trees, with lessons as to their value and character.

Certainly Arbor Day should be observed and plenty of trees planted; yet upon every day they should be protected and their habits studied.

Ample play grounds are indispensable, and grounds should be designed with a special view to shade and recreation. Trees should be planted in straight lines thirty feet apart, and a protection with stakes or boxes should be provided. Children, during excited play, are liable to injure, maybe destroy them; the hot sun will blister the exposed trunks and borers secure a lodgment, unless some protection is given.

Flowers and shrubs should be placed in borders hard by the school house and near the fences where they will be less liable to injury.

There is no region in temperate zones more favored by nature than

was the State of Indiana, with her wealth of forest vegetation, temperature, soil and rainfall combined, to promote the greatest variety of useful plants. More than 100 varieties of trees were indigenous to our State, while twice as many have been brought from other parts of the world and successfully cultivated, besides the thousands of shrubs and plants which abound from the Ohio to the Lakes, and it should be an easy matter to select a dozen trees suited to any location.

What are the requirements of a tree?

1. It should be useful for some demand of the manufacturer, as yellow poplar.

2. It may possess in a very high degree some special feature of usefulness, as the hickory—elastic, flexible and dense; oak, the symbol for strength; ash, combining strength with lightness; white pine, capable of being wrought with facility in carpentry; catalpa, having great durability; locust, having density, firmness, durability; linden, combining lightness with toughness, or walnut, the favorite of the early settler for making rails, and the manufacturer of to-day for magnificent furniture.

3. Americans demand immediate results, hence early maturity is an essential requisite. The swamp maples, poplars and catalpa are of quite rapid growth.

4. Freedom from disease and attacks of insects. The ginkgo, hackberry and sweet gum are remarkably free from both.

5. Ability to withstand drought. The two Russians, olive and mulberry, and the catalpa resists the effects of dry locations.

6. Adaptability. Suited to many soils, as the walnut, catalpa, ginkgo and maples.

7. Beauty of flowers. Magnolia, locust, tulip, catalpa, dogwood and many shrubs.

8. Density of shade. Elms, maples, chestnut, abele, cypress, linden, oaks, sycamore, catalpa, magnolia, yellow poplar, beech, hackberry, larch, Norway spruce, white pine, sweet gum, ash, locust, birch and ginkgo are all good for shade.

9. Ornamental foliage. Evergreens, cypress, weeping birch, larch, ginkgo, koelreuteria, etc.

A post hole should never be utilized in tree planting. Make the holes broad rather than deep and if the soil is not suitable, bring good earth to fill it. Obtain well-rooted trees, preferably nursery grown. A few stumpy roots may be sufficient to maintain life, but will not secure a vigorous, healthy growth, and while new roots are being formed the tree is starving, and borers soon take possession. These pests seldom injure a tree unless its vitality has been impaired by disease. A healthy, vigorous tree sends its roots far away from the trunk in every direction in search of food and moisture. The working fibrous roots are almost invariably sacrificed upon removal of the tree. Nursery-grown trees which have been transplanted, however, are supplied with these small roots in a compact mass. It is,

therefore, better to buy well-rooted trees rather than dig those in the woods.

Every bud which puts forth in a newly transplanted tree, requires a large proportion of sap. If many are left to expand the drain upon the tree will be greater than the roots can supply and a feeble growth will result. Hence it is best to cut back the top to correspond with the roots.

I recently recommended the following list for Arbor Day planting:

- | | | |
|-------------------|-------------------|-----------------------|
| 1. Scarlet Maple. | 7. Hackberry. | 12. Scarlet Oak. |
| 2. Gingko. | 8. Silver Maple. | 13. White Pine. |
| 3. White Elm. | 9. Yellow Poplar. | 14. Russian Mulberry. |
| 4. Larch. | 10. Sycamore. | 15. Linden. |
| 5. Sweet Gum. | 11. Ash. | 16. Honey Locust. |
| 6. Catalpa. | | |

The first thing in importance is shade; ornamentation follows naturally.

The gingko, from Japan, is one of our finest trees for shade, beauty of foliage, freedom from insects and disease, and seldom requires pruning.

The sweet gum can scarcely be surpassed, as it possesses almost every good and desirable quality.

The hackberry supplies a much-needed food for native birds, in addition to its superior quality as a shade tree, and is remarkably free from insects.

The scarlet maple forms a round head, requires less pruning than silver maple, its branches are less liable to injury in storms, while the autumn foliage is superb.

The larch has a foliage which is grand, the tree is healthy, grows quickly and naturally forms a handsome tree.

The yellow poplar, although not a poplar at all, but a liriodendron, or tulip tree, is one of our handsomest trees for shade and should by no means be overlooked.

Trees which would be considered magnificent specimens on a lawn would be out of place on school grounds, while those trimmed up as becomes necessary here and on streets would be undesirable about a mansion.

Governor Mount was here introduced, and spoke as follows:

Mr. President, Members of the State Horticultural Society: I am pleased to greet you and to say that you are deserving of a great deal of credit for your persistent perseverance in the midst of not altogether encouraging environment. I do not believe the State treats the horticultural society with proper consideration. I think it occupies a position in the State very important to the material progress and prosperity of the State. I think your efforts in the past entitle you to the greatest consideration on the part of the State, and not only that but the encouragement from the State in your efforts to advance your work. The time has come in

Indiana when more attention should be given to horticulture or to arbor culture; more attention to tree planting; when it will require more intelligent attention to fruit growing, and it seems to me it might be wise for the State to give more substantial encouragement to experiments along this line. We find there are so many things now to confront the farmers in every direction, especially fruit growing. We live in an age when climatic conditions, insect pests, etc., require scientific investigation and it requires constant effort to combat the ravages of these things, and this can not be done without competent men giving their time and attention to the work, and each individual feels that he can not give his whole time to investigation that will result in good to the whole people. The time has come when the State will have to make some more elaborate provision for the investigation of all diseases of fruit trees and provide for some means of a more thorough investigation. Until very recently we had no State entomologist. No one to go forth and inspect and see if insects were ravaging the orchards, and when the condition arose in this State, making it necessary to have some one, a man was appointed to do this work, and after the attention of the Legislature was called to it, a law was created to provide for this. We must take more steps and longer steps if we would make this a great horticultural State. A man has but to travel over Indiana and see the neglected orchards, the neglected homes, neglected in the way of shade trees, etc., to see that something is necessary to be done, and that we ought to have created among our people a desire to beautify as well as to add to the profit of our homes. How much more beautiful our State and our homes would be if more attention were given to these things. In many cases you fail to see good trees properly cared for. There is great neglect along this line, and until our State, as a State, realizes that horticulture is important and supports it with more earnestness I am afraid they will continue to let the horticultural interests go.

I know of nothing that will add more genuine contentment and happiness to the home than to have the surroundings beautiful, with a soil capable of producing that which is pleasing to the palate. To find these wanting when just a little time and attention would give them, it seems to me, such a home is a failure. It is not the great crops and fine herds that make the children think of the old home. They think of the purple clusters, the luscious fruits, strawberries, etc. The things that will be remembered about the home are the finishing touches that make home happy. It is the memories of these things that still linger with a man in after years. If we fail to give attention to these we fail in those essential elements that will endear us more to our children than anything else. I want to encourage the State horticultural society. It must do more. You are engaged in a splendid work but you are not appreciated as you deserve. I would that every citizen that has State pride and wants to see all the advantages brought to the country possible in the development of our fields and how to cultivate them, do more for this work. I never

expect to get too old to plant more fruit trees. I got alarmed last winter, as I thought the winter would kill the peach trees, but fortunately not one of my trees is injured and I had a fair crop of peaches. I plant pits and I get fruit from them when I do not get it by budding. I think we should plant fruit trees every year, and we must also begin to plant forest trees. We have gone recklessly forward destroying what nature gave us so abundantly, and we must now begin to stop the destruction of trees and begin planting others. We must give more attention to the planting of orchards. I believe farmers ought to plant a few peach trees every year. I know I get more of real profit and pleasure out of the time I give to beautifying the home and the planting of fruits and growing of flowers and things of that kind than from growing crops of grain and live stock. These things have a tendency to develop men and women, and that is better than to grow fine animals. What we want is to make our children love the home as, after all is said and done, the destiny of a nation is measured by the home, and we ought to see that there are such surroundings as will attract to these homes, and then it will be possible to exert an influence that will follow those who grow up in these homes down through the journey of life, and the principles fixed there will never be lost, and those attractions that kindle these memories will bring back to that person memories that will be an anchor of safety to them in the journey of life.

In conclusion let me say that your relation to the State is of more importance than you yourselves understand, so do not grow weary in well doing, but go ahead doing the best you can and make Indiana a great horticultural State, and you will be rendering a service that it will take more than time to measure the value of.

I thank you for the pleasure of speaking a word of appreciation of what you are doing, and to assure you of my hearty co-operation and my readiness to recommend to the Legislature when it meets what may be for the best interest of the horticulture of our State.

THE ORIGIN AND DEVELOPMENT OF THE APPLE.

JOHN MORGAN, PLAINFIELD.

A man born in an orchard on the banks of one of the most fruitful streams in Indiana, whose banks were lined with the black and red haw, serviceberry, raspberry and blackberry, and whose early school days were spent in the woods, where no cleared or cultivated field could be seen in any direction, and whose school path was only distinguished by a blaze here and there upon a walnut, a hickory or a hackberry, and made narrow by the encroaching hazel bush or berry-bearing vine, or overhung

with great clusters of papaws whose broad leaves and green fruit reminded him of later days when the frost would bring down the walnut and the shellbark and turn the green papaw to a rich brown and make its contents so rich, so aromatic, so enticing to a boy that language fails to portray its sweetness, such a man may be accused if he should talk about fruits and nuts and berries and wild flowers. But if that orchard in which he was born was an apple orchard and at the time of his birth great pippins were falling day and night on the roof and around the little cabin of 10x12, where he first saw the light of day, he might be pardoned beforehand if he should attempt to tell what he knows about that most valuable of all fruits, the apple. It is the first fruit in importance. Its period of ripening, unlike that of other fruits, extends nearly or quite through the year. By making a judicious selection of summer, autumn and winter varieties, a constant succession of this indispensable fruit can easily be obtained almost the whole year. But the question to-day is, What was its origin? Whence did it come? Was it made like Moses's account of Adam, made full grown all at once? Was there in the garden of Eden a tree laden with pippins? and Adam was allowed to partake of all russets and bellflowers and Jonathans and Grimes Golden except the one sweet pippin, and that he must deny himself? If so, no wonder Mother Eve stepped in and sampled that one. We do not think so. If Eve ever saw an apple it was a wild crab.

Geologically we find no remains of any kind of fruit trees until we reach the tertiary period. Agassiz, a geologist, whose statements must be received with respect by all and every student of science, finds reason to conclude that the order of the Rosaceae, an order of more importance to the fruit grower than any other and to which the apple, the pear, the quince, the cherry, the plum, the peach, the apricot, the nectarine, the raspberry, the strawberry and the various brambleberries belong, together with all the roses, was introduced only a short time before man appeared. Among the immense amount of fossilized plants yet discovered in the coal and shale, in which great forests for ages are represented, not a trace of fruit-bearing tree or bush can be found, or anything else for which man might have profitably labored as a dresser of gardens or tiller of fields or keeper of flocks and herds.

The early history of the apple is so enshrouded with legends and fables that even the derivation of the name seems uncertain. In Saxon we have appl and appul, in German, apfel; in Welch, aval and aball, which signifies fruit in general, and round fruit in particular, including the peach, plum and orange.

It is not improbable that the derivation may be from Sanscrit; that is, ap, water, and phul, fruit; water fruit, or juice fruit. At any rate we now have it spelled apple. The wild apple tree, from which our apple has been developed, *pyrus malus*, was generally distributed throughout

Europe and Asia, but was rare in Scotland. It is a tree very tenacious of life, living and bearing fruit frequently at the age of 200 years.

Pliny mentions the crab and wild apple as small and sour, so sour as to take the edge off of a knife, but some, he says, are remarkable for their fine flavor and the pungency of their smell. But he mentions others. The first fruit spoken of was of such enormous size that it could only have been produced by cultivation. Prof. N. Jalz, a celebrated French writer, says that the fruit of both the wild and cultivated apple formed a part of the vegetable food of the earliest inhabitants of Switzerland, and further remarks that the apple and pear have been found in the lake dwellings of that country preserved in rude hand-turned vessels. The fruit had evidently been cut in quarters to be more easily dried, and then was hermetically sealed with the skins of animals, and specimens occurred of such a size as could only have been produced by careful cultivation. Homer, the author of the earliest Greek heroic poems in the ninth century before Christ, speaks of the apple as being one of the fruit trees cultivated in the gardens, and other Greek writers, of later periods, extolled the virtues of the apple. We are also told that Philip of Macedon and his son, Alexander the Great, were so fond of this fruit that they had them placed upon their tables at every meal. It is not, however, until we arrive at the palmy days of the Roman Empire that we find distinct varieties enumerated and minute particulars given respecting the development and cultivation of the same. The Romans were undoubtedly enthusiastic horticulturists and availed themselves of the choice fruits of newly conquered countries.

The victorious generals took a delight in giving their own names to such fruits as they introduced into their own country, in memory of some important event or great service that they had done for their country. Pliny states that numerous apple orchards existed in and near Rome and Virgil nearly 2,000 years ago, in his Georgics, gives minute directions in grafting and propagating the apple. Julius Caesar had his orchard along the banks of the Tiber.

In whatever way grafting originated gardeners seemed to understand the art at a very early period, but seemed to think that the fruit partook of both the nature of graft and stock. There is so much said by the earlier writers that can not possibly be true about grafting and propagating, that it is difficult to sift it and get the true state of affairs. But from my reading and sifting I find that the gardens and roadsides were planted with at least twenty different varieties of apples, and were well known as Maullan, Claudian, Pompeian, Tiberian, and many others, after the names of celebrated people, by those who had either produced or introduced them.

The Romans introduced the apple into Great Britain. They no doubt introduced their favorite sorts and grew them in their gardens. But long before the Roman invasion apples were extensively grown in the south and

west of England. The ancient Britons had large orchards, and William, a celebrated historian of the twelfth century, speaks of King Edgar, 973 years before Christ, lying down to sleep under an old apple tree.

Pippins were cultivated and corresponded to our seedlings, called pippin from the fact that they were reared from pips or seeds, and not from grafts. We now apply the word pippin to apples having on them spots or dots. We find this line in Shakespeare: "We will eat a last year's pippin." He meant a seedling. I find but few kinds of apples mentioned in any of the ancient writings, except those named after some person, and not over twenty of them. But I do find frequently the pear-main mentioned, which, I suppose, means an apple shaped like a pear.

The fruit grower has watched the native fruit which, at first, only satisfied the severest hunger, stimulated it with better soils, more room, reared it from selected seeds from the most palatable specimens, judiciously pruned and cared for the trees, and his labors have been rewarded by the sour and bitter crab expanding into the aromatic pippin.

The wild pear becomes a Clapp's favorite or a rich and buttery Bartlett, and the bitter almond is, as if by magic, turned into a delicious peach. While fruits are in the wild state they exactly reproduce themselves for ages where the outward circumstances are the same. Occasionally a seed may find its way in better soil, surrounded by different environments, and thus produce a sprout from which a superior fruit can be obtained different in type and character from the original. But it has been a habit among the people in the rural districts to plant the seed of the best fruits, especially the apple and peach, for ages. I think it has done much to change and improve the fruits until a type has been formed which has been then seized upon by the nurseryman and propagated by budding and grafting, thus keeping up and establishing the well known varieties, and by a vigorous culture in the nursery, the fruit has been increased in size and quality. I am at a loss to know which of the three causes has done the most: The natural sprouts, caused by seed falling in favorable locations, selection and planting and culture by man, or the keen eye and fine taste of the horticulturist and nurseryman, in bringing out the best varieties. But one thing certain is true that all three have combined and produced the results that have so blessed mankind.

Another mode of improving our fruits has been practiced, both by nature and art, that is cross-breeding. It is a law of nature that if the pistil of the flower is fertilized by the stamen of another variety, we shall obtain a seed which if planted, will produce a fruit partaking of the properties of both parents, or allied to both, sometimes one parent and sometimes the other. I have a friend in Missouri who carefully fertilized the yellow bellflower bloom with that of the red June, and planted the seed of the fruit obtained. From the seed he produced one tree whose fruit has the shape, size and flavor of the yellow bellflower, but entirely red in color. There is no limit to the number that can be thus pro-

duced. This will be, no doubt, the plan in the future. The selection and cross-fertilization for the sole purpose of producing seed from which to raise new varieties, and our fairs will yet award premiums to the best seedlings, and experiment stations and private individuals will enter in the contest.

It was this careful study and selection which, in the course of centuries, has developed the hard acrid crab apple to the mellow bellflower, which has wrought out from the sour seedling the delicious pippin and has also changed the once acrid nut to the rich and delicious peach. We to-day relish the fruits with which our orchards are laden, little dreaming of the great labor our predecessors took in sowing seed, grafting and selecting for not only themselves, but for the generations that were to follow them. Are we doing as much? I believe the work is only commenced, and that the horticulturists will yet produce apples as much superior to what we have now as the chrysanthemum at the annual shows is superior to its little dwarf great grandfather found in Southern Europe and Africa, or the carnation from its great grandparents found in the woods.

I had rather produce an apple that would go into general use and add to the food used by the masses, than to amass a fortune to erect a monument to perpetuate my name. Yes, I had rather produce an apple with the spicy flavor and good eating and cooking qualities of the Northern Spy, the hardness of the White Pippin, the keeping qualities of the Lansingburg, the productiveness and appearance of the Ben Davis, than to have an LL. D. to my name and endow a college. He who produces a fruit for the masses is a benefactor, especially if that fruit is such that it can enter into as many dishes, prepared in as many ways as the cook can invent, and at the same time be just as good eaten uncooked from the hand. Such a fruit is possible and will yet be produced from our present apple.

DISCUSSION.

Mr. Johnson: There is nothing I can criticise, I can only commend it. It was an excellent paper, and will be of service to our Society.

Mr. Tilson: I do not know of any one who is better able to discuss the development of fruit than our President, and I would like to hear something from him on this subject.

Mr. Hobbs: I have nothing in mind that will be of special interest to you on this topic. I only wish to say that the paper is very good indeed, giving the historical development of the apple and pointing out lines for furthering the growth. This society is carrying out this idea to-day. We have established an experimental orchard, and through these means we hope to develop the ideal apple. I hope we shall reach that point, but

that is of course some distance in the future. Unfortunately the apple, the most important of fruits, takes quite a time to come to fruitage. The experiment must necessarily cover a long period of time.

Mr. Henby: While I heartily approve of this, I want to ask this question: Has the apple been improved one particle in the last fifteen years? Take our yellow bellflower, or rambo, maiden blush or Jersey black, etc., have we in this later day been able to produce anything to compare with them?

Mr. Hobbs: We have not. That is plain, but conditions have changed under which we grow these varieties. I have been thinking along this line, there is more in fertilization, etc., than we think. If we would take those older apples, and give them proper cultivation, we might have more than we do. There are more sudden changes in temperature, and we must be able to meet all these conditions in order to protect the tree and grow good fruit.

Mr. Ratliff: During the very dry part of the summer we had a good many fires along the railroad, and the consequence was a great deal of damage done to property, and especially to orchards. The question came up as to what a bearing apple tree, say about ten years old, was worth. Men had been appointed to appraise the damage from fire to these trees, and they seemed to differ in their opinion as to what the apple trees were really worth. I would like to hear an expression as to this matter.

Mr. Kingsbury: My Benoni apple tree is worth \$50 to me.

Mr. Ogg: I should think \$25 or \$30 per tree.

Mr. Cotton: I think from a legal point we would estimate the value of the ground with taxes and crops, and also the labor placed on that orchard in the cultivation of it should form a basis for an estimate of the value of the trees.

Mr. Kingsbury: What would be a fair price for spraying an orchard of 100 trees three times?

Mr. Flick: I should think this depends a good deal on circumstances. It depends on the size of the trees and the distance we would have to drive to the orchard, and many other things. We sprayed about 300 trees a day. I estimated the cost at one barrel of liquid to fifty or sixty trees, about a gallon to a tree. It depends a great deal on circumstances. I estimated about fifteen cents per tree for three sprayings.

The time for holding the annual meeting was discussed.

Mr. Custer: In regard to our annual meeting, it seems to me it would be more suitable to hold it at the old time. I do not see that we have any larger attendance than we had other years. For my part, I would rather

have it the first of December and pay full railroad fare. I therefore move that the constitution be amended, and the time changed to the second Tuesday in December.

Mr. Apple: I think we have made a mistake in having this meeting in connection with the other meetings this week. I came here as a delegate to the insurance meeting, and instead of enjoying the benefits. I have had to pass back and forth from one meeting to the other, and as Mr. Custer has stated, I do not see that we have any better attendance than last year, and I am in favor of changing the time back to December.

Mr. Grossman: While I deplore the confusion and lack of enthusiasm in this meeting, which I believe is caused by mixing up so many societies. I can state that a number who are here would not have been here if we had not gotten a low rate on the railroad, as the expense is so great to those who live so far. If we can get a rate I would prefer December.

Mr. Johnson: I believe I would like to compromise between the two. If I remember right, we have reduced rates during the holidays. Our teachers' institutes are held then, and I believe in order to get the benefits of reduced rate it would be better to have the meeting during the holidays, or between Christmas and New Years. I would like to make an amendment.

Mr. Tilson: The poultry men get reduced rates every time they hold their meetings in December. I much prefer to meet some other time than during the holidays.

Mr. Cotton: I move that the constitution be amended to read that the time of the next annual meeting shall be decided by the Executive Committee.

Motion carried.

A paper on "Essentials to Successful Orcharding" was received from Mr. W. F. DeVilbis, of Fort Wayne, but for want of time it was not read. The essential points of the paper were as follows:

The first essential to successful orcharding is location with reference to market.

I have seen fine fruit on peach trees two years from the seed in Florida where nature is certainly prodigal of perfection, but here in a climate like ours where nature has not bestowed so much sunshine, but where we have an almost unlimited market, man must arise and master the situation. Within a radius of 286 miles of Indianapolis, the center of population in the United States, there is in city and town a population of over seven millions of people. The people of Indiana can not expect to compete with the Great West in growing grain to feed the people. They must grow the luxuries of life, fruit, vegetables, poultry, etc. I expect to see the day when Indiana will be so densely populated that forty acres will be considered a large farm.

Second. In selecting a site for an orchard the land should be as high or higher than that immediately surrounding it. For most fruits a north-west slope would be preferable. First, choice of soil would be a clay loam with a clay subsoil. From my own experience on this kind of soil trees will stand more freezing than on sandy or black soil. Black level land surrounded by higher land is not suitable for an orchard.

Third. Select good, healthy trees two or three years old. Cut off all broken or badly bruised roots with a sharp knife. Do not use pruning shears. They loosen the bark on the end of the roots so that it takes the tree much longer to send out new feeders or rootlets. Do not cut the top so as to balance up, as some call it, but trim with a view to future beauty and usefulness.

Fourth. Use business methods in pruning, spraying and cultivating. Begin pruning after hard freezing weather is over and continue until done. Do not wait until you have to use the ax or saw. The ordinary pruning knife (not pruning shears) I find to be decidedly the best tool to use. Spray only when the trees need it; for instance, the coddling moth gets his work in just as the blossom has fallen; then, and only then, can you get him, for if you wait until the apple has turned down he is a winner.

Fifth. To be successful you must first learn that success is not the gift of fortune, it is not wafted to you on the breezy wings of chance. Whoever Dame Fortune may be, or whatever she may do, she never gives away any of her good things. She is not careless of her treasures. She sells her best to the highest bidder, and these bidders are the hardest and most intelligent toilers. You pay the highest price and receive your reward in fine, thrifty trees, and in due time a bountiful crop of fruit.

THURSDAY EVENING.

The following officers were elected for the year 1900:

President—C. M. Hobbs, Bridgeport.

Vice-President, First District—Mrs. W. W. Stevens, Salem.

Vice-President, Second District—George P. Campbell, Bloomington.

Vice-President, Third District—Amos Garretson, Pendleton.

Vice-President, Fourth District—J. C. Grossman, Wolcottville.

Secretary—Prof. J. Troop, Lafayette.

Treasurer—Sylvester Johnson, Irvington.

Executive Committee—E. Y. Teas, Jesse C. Stevens and L. B. Custer.

SOME OF THE ESSENTIALS TO SUCCESSFUL FRUIT GROWING.

R. MORRILL, BENTON HARBOR, MICH.

I will say that I am new to you and entirely green as to Indiana horticulture, but I presume it is somewhat similar to Michigan, so I shall not attempt to go into details except in a conversational way. I do not think it best to more than outline my opinions. I might write a large volume on this topic. I have only selected a few fundamental principles to successful fruit growing. This is rather indefinite. We have a variety of accomplishments that we call successes, but I think to-day that means the amount of success that makes a good bank balance. Take President Lyon, of Michigan. He never made a dollar for himself, but his life has been successful to horticulturists. We will take the commercial view of it, not touching the horticulture that is built up around the home for the pleasure that we get out of it. From a commercial standpoint there are a few fundamental principles that must underlie our work or to-day there can be very little success. I have just grouped these into, first, the man; second, location; third, soil; fourth, fertility; fifth, troubles we have to contend with. The successful stock breeder has to have everything in the breeding of animals all right to make a good animal. It must all rest with the man. This man must love the business. He must be genius enough to know what he has to meet. He must be genius enough to select the proper location. The man who at the outset spoils a good meadow by planting a peach orchard will not land a bank account. He may take a good apple orchard location and plant peach trees and may never land a winner. If he fails in any particular he can not make a commercial success. If he makes one other mistake, that is so common and is being done all over the United States, of attempting more than he can possibly accomplish he will not make a success. A little work well done will show good profit. A large amount equally well done will show better, but then comes the capacity of the man; his brain capacity and capacity to handle a large business. We all have to figure out pretty accurately, and it is surprising sometimes to see how quickly some men with money can learn all these essentials of fruit growing. I am not going to say any discouraging things here. I imagine this is largely a fruit growers' audience. In large meetings I have often seen men come in and catch an idea and then, in side talks, would learn that they were intending to plant large orchards. They have been picking up information and will venture large sums on it on the strength of the large price made by some one in the United States, feeling that in general lines of thought it did not require much brains to be a farmer and it does not require much intelligence to grow a crop of fruit. It requires just as clear a brain and just as good judgment to handle agriculture successfully as it does

mercantile pursuits. A man must be fitted for his business first, otherwise he will never land a bank account. A man who loves the business can fit himself for it. A man to be a successful horticulturist must be a genius. There are many things he must understand. He must be ambitious. He can not be lazy and be successful. He must have lots of hard sense. He must know something of entomology; he must know a great deal about soils, and he ought to have special training in horticulture. If he has not had it he had better rely on the most successful men available to him, and there is where the horticulturist or fruit grower of the United States is a peculiar "critter." He will give away everything he knows. He will tell all about how to avoid the little things that injure and destroy and how to make money. You can generally get good information if you are only able to carry it out. We are peculiar "critters." While we stand face to face with one another and tell these things without any object in view more than to help each other, we sometimes doubt each other's ideas. So much for the man.

Location.—I do not know what we want to talk about here in the way of fruit growing, but we will say I want to plant a peach orchard. I would want high, dry, rolling land. When the last few degrees of frost come you want to be above the lower level of the cold air. In apples it is not so necessary; also in pears. Our climate is usually safe on them. We should have dry, sandy soil for peaches. With apples that have to stand on land forty to fifty years, we want good land. We want good clay loam for the best results. That is an enduring soil that is constantly furnishing the correct elements for the soil. I specify that kind of soil for the best apple soil. Cultivation is something which some of us peach growers believe in. The majority of the orchards in the country are sod bound, root stunted, top stunted, and it is probably the outgrowth of conditions which have grown upon us insidiously. Our fathers planted apples wherever they wanted to and at the proper time they had a crop of fruit. To-day we can not do that. We must earn it and find new methods. The old cattle pasture plan will not do any longer. We must bring our best brain force to grow fruit and compete in the markets of to-day. We have to have understanding of what thorough culture means. I can tell you what it means for me in my peach orchard. Plowing two and a half inches deep early in the spring; follow that with a spring tooth harrow, then with a smoothing harrow, then with a weeder and work the orchard twenty to forty times during the season, hoeing under the weeds. Whenever my land breaks I fill the gullies with the small trimmings, butts upward, and then it does not wash for several years. I could not see my way clear to do without good culture. I do not believe I would chance putting an orchard on land that is very hilly and washy. The young trees we quit cultivating about the 1st or 10th of August. Old trees not bearing I would stop about the 15th of August, and if they are bearing I would cultivate as long as I could get under them. I always

put oats around them at the last cultivation. A good clay soil has a vast amount of fertility, but in some of the best apple orchards in western New York they become unproductive. Now a great many of those men are making phenomenal records on apple production. Those people haul in, on an average, a car load per acre per annum of stock yard manure. They cultivate very thoroughly and there are orchards there that last year produced better than \$500 per acre off of their apples. There is one orchard on the Hudson River that had a crop from 101½ acres which sold for \$15,000.

Fungi and Insects.—Our fathers were not troubled with them much, but to-day we must spray or surrender. There are fungus troubles that are gnawing at the bark and at the roots. There are insects of every character beginning at the root, the top, the bark, the foliage and the fruit. They have to be combated by some means. To-day the best means for most of these is the use of various sprayers. Water is the best medium for disposing of these materials. Many mistakes are made by the improper understanding of the formula. Spraying for these troubles is a fine art of horticulture. Just right and you win; just wrong and you had better kept your money and labor. The success that some men claim is based entirely on their getting accurate knowledge. Other men equally as bright will pronounce the various mixtures a failure because they fail. They did not get the right end of the string. Men are so loth to acknowledge their failure that sometimes one gives up in despair, knowing that there are mistakes somewhere, but they did not know where. There are two distinct troubles, insects and fungi.

The Marketing of Fruit.—If you have gotten clear through, you will land your bank account, but it may slip through your fingers at the last end. I think to-day that while the average fruit grower does not often lie when he talks, sometimes he will lie when he packs apples. In peach growing it often occurs that for some reason the best is on top. The packages are built so that nothing but the best fits the top.

There is a right and a wrong time to pick apples. They are usually picked too late. That may seem peculiar to a good many people, but an apple will mature on the tree and hang there in apparent sound shape so long that they will not keep long afterward. An apple picked at the proper time, that is, immediately after it is well colored, should be picked and hurried into a cool place. It will ripen very nicely in the barrel. Some varieties will develop their color and some will develop a finer appearance than on the trees. In the barrel, under proper temperature, most any variety will develop a handsomer appearance than on the tree. The flavor will differ in different varieties. Some improve in flavor and some lose their flavor. Those are things that only experience can show. Each has some different quality. The package and manner in which fruit is put up conveys the impression to the purchaser the moment he puts his eyes on it as to the kind of man who was behind the package, whether

a thoroughbred or a scrub. There is no profit for the scrub fruit grower. If you are not a first-class fruit grower you are not "in it." There is no reason why any one can not learn these things and be successful. Another thing, perhaps a little contrary to some of my statements, the man who has a large quantity can outsell the man who has a small quantity. The buyer is looking for car loads and not cart loads. Buyers will go across the continent where they can buy train loads of goods. I do not believe it is necessary to go any further with this. These are the fundamental principles of fruit growing as I see it. I heard a little talk to-day in regard to spraying. I imagine you have not gone into it as deeply as we have because some of our people have reduced it to a science and to a point where it has become a fixed part of the work. They know exactly what they are doing. I refer to that now for fear I may overlook it. We use Bordeaux mixture, which is composed of five pounds of copper, five pounds of lime and fifty gallons of water. We find that the cost of the material and labor of putting it on the tree will average about one cent per gallon. Concerning the spraying of trees about twenty-five years old, I can not cover a tree like that with less than three gallons, and that is working very economically. We use a large tank of 250 gallons. Spraying is strange to a good many people. Some people do not know what they are spraying for. We must understand the history of the moth and understand when to apply the remedy. The apple when it blooms stands up and outward, the petals open, and immediately after the petals fall the calyx closes up and as it closes up it turns down. We used to think that the codling moth laid its egg in the blossom end. We know they lay some on the outside of the apple, but the young worm gets in there. A little poison must be in that open spot. Wait until the petals drop and go immediately and put on your paris green, no matter if it rains in thirty minutes. I do not believe rain washes it out. If the first crop is not all killed there will be a second crop. We combine Bordeaux mixture and paris green, I use one pound of paris green to 150 gallons. There are other arsenic poisons just as good as paris green. Combine it with lime to keep it from washing out. I mention these things simply to impress on you that if you do not do it at this certain time, you might as well not attempt it.

The second crop of codling moth usually comes and lays the eggs and raises another crop of moths and spoils all the apples. They will usually go where two apples come together. I think three-fourths of them work where two apples touch each other. I don't know of any better way to take care of this than to keep hogs in the orchard.

I spray in the fall first. I think there is a good chance to kill the apple scab. In the spring we spray early, as soon as it is warm and before the leaves are out. We spray again as the buds start. The apple scab spore begins to be active and will work on the soft spots. If you do not kill the spore before the plant growth starts, and gets into the apple, you

can not kill it. I use the simple copper solution and in the spring I begin with Bordeaux. I like to save expenses and the trouble of making it, and I use the copper solution first as it can not do any damage. We know that contact kills the spores very quickly. When it comes spring and we know in a few days the spores will be active, then I begin with the solution. These troubles are cumulative in an orchard. An orchard may just be coming to that point when it will be worthless, and no man ought to expect to take a spray pump and in a week or two cure the orchard. If you do your work well you will see good results the first year but in several years you will see cumulative results. It may take five years to get that orchard to look like your grandfather's looked.

Cultivation and Fertility.—In western New York the orchards have been sod bound for a number of years, but now they are never sod bound. Some sow rye and some crimson clover. I have a friend in Benton Harbor who has eighteen acres of apples. He went to cultivating and he has taken five crops in succession and there is no other man around there who has taken more than one crop. For scab, I usually spray four times. I spray the last time when the apples are about the size of walnuts. If I had an orchard that grew well but did not bear, I would give it a little late summer pruning.

DISCUSSION.

Mr. Burton: I have been very much pleased with Mr. Morrill's address, but I hate to have him go back to Michigan and tell the people there that he stuffed these Hoosiers. I believe he has received some of his education in the East, and sometimes they were wrong there. In regard to the time to gather apples, I do not believe Mr. Morrill is just right on that point. I want to present this idea, that an apple will ripen off the tree as fast and a little faster than on the tree, provided it has as warm a situation off the tree as on it. The apple while on the tree is protected, and when taken off is not well protected.

Mr. Johnson: Do you spray for insects on peach trees?

Mr. Morrill: We do not spray for insects on peach trees at all, but we spray some for curl leaf.

Report of Committee on Exhibits read and accepted.

REPORT OF COMMITTEE ON EXHIBITS.

Your Committee on Exhibits has made the following awards:

APPLES.

	<i>First.</i>	<i>Second.</i>
Smith Cider, J. C. Grossman, Wolcottville, Ind.....	1	..
Smith Cider, J. C. Grossman, Wolcottville, Ind.....	..	2
Ben Davis, J. Y. Demaree, Bud, Ind.....	1	..
Ben Davis, John Tilson, Franklin, Ind.....	..	2

	<i>First.</i>	<i>Second.</i>
Rome Beauty, Joe A. Burton, Orleans, Ind.....	1	..
Rome Beauty, J. Y. Demaree, Bud, Ind.....	..	2
Baldwin, B. F. Cole, Trafalgar, Ind.....	1	..
Baldwin, W. D. Thomas, Groves, Ind.....	..	2
Grimes' Golden, W. B. Flick, Lawrence, Ind.....	1	..
Grimes' Golden, W. B. Flick, Lawrence, Ind.....	..	2
Winesap, Joe A. Burton, Orleans, Ind.....	1	..
Winesap, J. Y. Demaree, Bud, Ind.....	..	2
Stark, J. Y. Demaree, Bud, Ind.....	1	..
Stark, J. C. Ratliff, Richmond, Ind.....	..	2
Clayton, W. D. Thomas, Groves.....	..	2
Mann, W. D. Thomas, Groves, Ind.....	1	..
Mann, J. W. Apple, Oaklandon, Ind.....	..	2
Salome, Joe A. Burton, Orleans, Ind.....	1	..
Salome, S. T. S. Williams, Knightstown, Ind.....	..	2
Lady, J. C. Ratliff, Richmond, Ind.....	1	..
Indiana Favorite, J. C. Stephens, Centerville, Ind.....	1	..
Indiana Favorite, C. A. Garretson, Pendleton, Ind.....	..	2
Wagener, J. C. Grossman, Wolcottville, Ind.....	1	..
Peck's Pleasant, J. C. Grossman, Wolcottville, Ind.....	1	..
Roman Stem, W. D. Thomas, Groves, Ind.....	1	..
Roman Stem, J. C. Grossman, Wolcottville, Ind.....	..	2
Jonathan, C. A. Garretson, Pendleton, Ind.....	1	..
Jonathan, W. D. Thomas, Groves, Ind.....	..	2
Yellow Bellflower, W. D. Thomas, Groves, Ind.....	1	..
Yellow Bellflower, W. D. Thomas, Groves, Ind.....	..	2
Rhode Island Greening, W. D. Thomas, Groves, Ind.....	1	..
Rhode Island Greening, J. W. Morehouse, Albion, Ind.....	..	2
Northern Spy, W. D. Thomas, Groves, Ind.....	1	..
Northern Spy, W. D. Thomas, Groves, Ind.....	..	2
Rambo, J. W. Morehouse, Albion, Ind.....	1	..
Rambo, B. F. Cole, Trafalgar, Ind.....	..	2
Pennock, J. W. Morehouse, Albion, Ind.....	1	..
Rall's Genet, W. B. Flick, Lawrence, Ind.....	1	..
Rall's Genet, Joe A. Burton, Orleans, Ind.....	..	2
Willow Twig, B. F. Cole, Trafalgar, Ind.....	1	..
Willow Twig, Joe A. Burton, Orleans, Ind.....	..	2
Roxberry Russet, W. D. Thomas, Groves, Ind.....	1	..
Roxberry Russet, Chester A. Garretson, Pendleton, Ind.....	..	2
Romanite, Chester A. Garretson, Pendleton, Ind.....	1	..
Jersey Black, Chester A. Garretson, Pendleton, Ind.....	1	..
Jersey Black, J. C. Stephens, Centerville, Ind.....	..	2
N. W. Greening, S. T. S. Williams, Knightstown, Ind.....	1	..
Malden's Blush, W. D. Thomas, Groves, Ind.....	..	2

	<i>First.</i>	<i>Second.</i>
Lansingburg, W. D. Thomas, Groves, Ind.....	1	..
Lansingburg, Evan Swift, Franklin, Ind.....	..	2
Pewaukee, B. F. Cole, Trafalgar, Ind.....	1	..
Pewaukee, W. D. Thomas, Groves, Ind.....	..	2
Hubbardson, W. D. Thomas, Groves, Ind.....	1	..
Tulpehocken, W. D. Thomas, Groves, Ind.....	1	..
Tulpehocken, W. D. Thomas, Groves, Ind.....	..	2
Vandevere Pippin, W. B. Flick, Lawrence, Ind.....	1	..
Vandevere Pippin, W. D. Thomas, Groves, Ind.....	..	2
York Imperial, W. D. Thomas, Groves, Ind.....	1	..
York Imperial, W. D. Thomas, Groves, Ind.....	..	2
King, B. F. Cole, Trafalgar, Ind.....	1	..
King, J. Y. Demaree, Bud, Ind.....	..	2
Pryor's Red, J. Y. Demaree, Bud, Ind.....	1	..

PEARS.

Best display of pears, W. B. Flick, Lawrence, Ind.....	1	..
Best plate of pears—Duchess—W. B. Flick, Lawrence, Ind.....	1	..
Best plate of pears—Keiffer—W. B. Flick, Lawrence, Ind.....	..	2

QUINCES.

Best plate, any variety, Snead Thomas.....	1	..
Best plate, any variety, W. B. Flick.....	..	2
Best plate of apples adapted to Southern Indiana—		
Grimes' Golden, Joe A. Burton.....	1	..
Rome Beauty, Joe A. Burton.....	..	2
Best plate of apples adapted to central Indiana—		
Ben Davis, Chester A. Garretson.....	1	..
Jonathan, Chester A. Garretson.....	..	2
Best plate of apples adapted to northern Indiana—		
Stark, Chester A. Garretson.....	1	..
Smith Cider, J. C. Grossman.....	..	2

FLOWERS (*Professional*).

Best display of carnations, Fred Dorner & Sons, Lafayette....	1	..
Best display of carnations, Fred Dorner & Sons, Lafayette....	..	2
Best display of carnations, (amateur), Mrs. W. B. Flick.....	1	..
Mixed cut flowers, Mrs. W. B. Flick.....	1	..

Mr. L. B. Custer, of Logansport, exhibited a plate of Autumn Seek No Further apples, which your committee recommends as worthy of notice.

Respectfully submitted,

E. Y. TEAS,
GEO. P. CAMPBELL,
J. W. STANTON,
Committee.

REPORT OF THE COMMITTEE ON RESOLUTIONS.

Your Committee on Resolutions begs leave to make the following report:

Resolved, That we believe a greater effort should be made by our society to disseminate the principles of horticulture and agriculture and to lay the practical workings before the people of this State. We therefore instruct our vice-presidents to be more diligent in the organization of local societies in their various districts whose objects should be to promote these interests.

Resolved, That we approve all efforts to improve the appearance of our common school grounds, and in order to encourage such improvement by the planting and care of shrubs, trees and flowering plants, we hereby offer premiums as follows:

First premium	\$10 00
Second premium	8 00
Third premium	5 00

The conditions to be named by the Executive Committee.

Resolved, That the Indiana Horticultural Society hereby renews its loyalty to Purdue University, and promises in the future, as in the past, to give it its undivided aid and support.

Whereas, The women of Indiana, through their clubs and with the hearty co-operation of the 1,000 women represented by the local Council of Women of Indianapolis, are asking that the State Agricultural Society go farther in the good work begun last year in providing special lectures for women, and erect upon their grounds a building suitable to use as a lecture hall and a woman's dormitory. We hereby

Resolve, That this society gives to this movement its hearty approval.

Whereas, Peter M. Gideon, an eminent fruit grower and practical horticulturist of Excelsior, Minnesota, departed this life October 27, 1899, after having earned a reputation almost national in its character by hybridizing and the propagation of new fruits, especially of the apple, in consideration of the fact that he originated the Wealthy apple, a variety indispensable to every fruit grower, together with other varieties entitled to a place in our catalogue, the Indiana Horticultural Society offers this tribute of respect to his memory:

Resolved, That in the death of Peter M. Gideon, pomology has lost one of its most devoted and zealous advocates and that every bearing Wealthy apple tree wherever located is a standing monument to his memory.

Resolved, That the thanks of this society are hereby tendered to Messrs. Stanton of Illinois, Mr. Charlton of Plainfield and Superintendent Turnan of Madison County and Mr. Morrill of Michigan for their able and instructive lectures on subjects treated.

Resolved, That we extend our sincere thanks to his Excellency. Governor Mount, for his presence and for his encouraging and interesting remarks in which he assured us that we may depend upon his hearty cooperation in all of our undertakings.

Respectfully submitted,

J. TILSON, Chairman.

Adjourned.

MEETING OF THE EXECUTIVE COMMITTEE, MARCH 4, 1899.

The Executive Committee met at the Society's rooms with the following members present: W. H. Ragan, Snead Thomas, C. M. Hobbs, J. Troop and Sylvester Johnson, Treasurer.

It was moved and carried that the usual premiums offered by the Society at the State Fair be discontinued for the present on account of the failure of the last Legislature to grant the usual appropriation.

It was moved and carried that \$50 be appropriated for premiums at the summer meeting.

It was moved and carried that the different manufacturers of spraying machinery be invited to display their products at the summer meeting.

The horticultural premium list offered by the State Board of Agriculture was revised and the same recommended to that body for adoption.

MEETING OF THE BOARD OF HORTICULTURE, AUGUST 10, 1899.

At the close of the summer meeting the Board of Horticulture met, audited accounts, gave necessary instructions to the Superintendent of the Experimental Orchard and authorized the Secretary to offer \$100 in premiums at the annual meeting.

MEETING OF THE BOARD OF HORTICULTURE, JANUARY 4, 1900.

At the close of the annual meeting the Board of Horticulture met, audited accounts, paid premiums on the fruit exhibits and instructed the Secretary to have 500 copies of the annual report for 1899 printed.

REPORT OF COUNTY HORTICULTURAL SOCIETIES.

REPORT OF CASS COUNTY HORTICULTURAL SOCIETY FOR YEAR 1899.

The Society held nine monthly meetings during the year. The Society held a berry show in month of June, at which there was a fine display of strawberries, cherries, currants and gooseberries.

Thirteen dollars in premiums was paid by the Society. A good display of apples and pears were brought to the October meeting by members of the Society.

The Society elected the following officers for the ensuing year:

President, L. B. Custer; Vice-President, C. A. Brandt; Secretary, Everett Banta; Treasurer, John P. Martin; Executive Committee, B. T. Campbell, J. H. Rohrer and L. H. Brown.

The Society begins the new year with several new members and a surplus in the treasury.

Logansport, Ind.

JOHN P. MARTIN, Secretary.

REPORT OF ST. JOSEPH COUNTY HORTICULTURAL SOCIETY.

This Society still maintains its usual membership and holds its regular meetings the last Saturday of each month at the homes of members or at county court house. We have a fair attendance and subjects of interest are discussed at each meeting.

Officers elected for the ensuing year are:

President, H. H. Swaim; Vice-President, George F. Newton; Secretary, H. W. Newman; Treasurer C. P. Bradley.

The Society enters upon the work of 1900 with the brightest prospects.

D. K. ROCKHILL, Secretary.

REPORT OF NOBLE COUNTY HORTICULTURAL SOCIETY.

Dear Sir—The Noble County Horticultural Society, during the past year, beginning December 21, 1898, and ending December 14, 1899, enrolled on its list of members forty-two paid new members. Total number, eighty.

It held six regular meetings during the year. Two of these were held at Albion, one at Rome City and three at the homes of members.

One called meeting of officers and working members was held.

A full report of the year's proceedings will be published in society premium list for 1900 and copy mailed you as soon as published.

Receipts.

1898.	Dec. 21, Cash balance on hand.....	\$9 85
1899.	On account of dues.....	21 00
	For advertising	125 00
	Premiums Indiana State Fair.....	77 50
	Miscellaneous	28 70
Total		\$262 05

Expenditures.

1899. Printing premium list.....	\$77 00
Entertaining State Society.....	49 03
State exhibit expense.....	31 10
Miscellaneous	26 15
	<hr/>
Total	\$183 28
	<hr/>
Balance on hand.....	\$78 77

The apple crop was large but of poor keeping quality; peaches and pears for commercial purposes, a total failure. In small fruits the crop was abundant and prices correspondingly low.

Fruit buds at present are all right. This Society, after transacting four times as much business this year than last, begs leave to report increased membership, increased cash balance in the treasury and in all respects has a bright prospect for the future.

JNO. W. MOORHOUSE, Secretary.

REPORT OF THE JOHNSON COUNTY HORTICULTURAL SOCIETY.

This Society was organized in January, 1898. Our membership has continued to increase and we now have enrolled about fifty.

Although our county's horticultural display at the State Fair has done her great credit she is as yet in her infancy as regards fruit growing.

There is much rolling clay land in the county, affording both air and water drainage, consequently well adapted for fruit growing.

We still continue to meet each alternate month in the court house, fair grounds or private house, the season and weather conditions governing.

At our strawberry meeting, held at the residence of a member when the strawberry is at its best (usually the last of May), in addition to a bountiful basket dinner, we have the strawberry served in all its various styles.

JOHN TILSON, President.

J. H. POTTENGER, Secretary.

REPORT OF THE WAYNE COUNTY AGRICULTURAL AND HORTICULTURAL SOCIETY.

It is gratifying to state, in this my regular annual report from this Society, that the past year has been one of general prosperity in this section of the State with the farmer, the orchardist, the gardener and the small fruit grower. Although the weather at times during the year was somewhat unseasonable, the progress made in the various industries has equalled any in recent years.

It is true that the extreme cold on February 13th materially injured some fruit trees, especially the peach, grapevine and some unprotected berry canes. The heavy coating of snow served as a blanket in many cases, and all things thus protected emerged from the winter uninjured.

The membership of the Society consists of almost 100 persons with their families and embraces those pursuing the various avocations. From the humble "peasant," who occupies the little cottage on the hillside with his fruit trees, his grapevine, his flowerbed and his berry patch, to the college professors and members of our legislative assemblies who raise their voices in behalf of agriculture and pomology and secure the passage of such laws as are favorable to those engaged in these pursuits.

Officers for 1899: President, Hon. Jesse C. Stevens; Vice-President, Folger P. Wilson; Recording Secretary, Walter S. Ratliff; Treasurer, Jehu P. Norris; Corresponding Secretary, Hon. Jos. C. Ratliff; Executive Committee, Hon. Jesse C. Stevens, ex-officio; W. H. Lough, Hon. Jos. C. Ratliff, James Smith, Kate Ayler, Kate Scott, Mary Sutton and Mary Dickinson.

ANNUAL DINNER.

One of the principal social times of the year is the annual February dinner which is one enjoyed by our members and their families. Premiums are offered by the Society for exhibits of prepared culinary articles, consisting of turkey, cakes, pies, etc., which are passed on by an awarding committee and placed on other tables already prepared, with the other viands to be eaten by the members.

AGRICULTURE.

The past year has been a period of activity and gain. The early pastures were refreshed by copious rains. Live stock did well except during the severe drought of late summer which also lessened the yield of the hay crop. Corn was above the average in yield and quality and was gathered in excellent condition. The yield of wheat was about eighteen to twenty bushels to the acre; oats, not heavy, with straw very short; horses and mules in greater demand and bringing good prices; beef cattle at the top of the market and rather scarce; milch cows unusually high priced and not very plentiful; hogs mostly healthy but not many more than common fed for shipping purposes. Sheep herds are becoming more common, doubtless due to less adverse legislation.

FRUITS.

The grower of fruits is used to disappointments. The February cold killed back the grapevines considerably and a dearth of ripe bunches resulted. The raspberry and blackberry canes suffered much, but average yields were gathered; gooseberries and currants were fair; strawberries were abundant and the output was gathered in bushels, and the consump-

tion of this luscious fruit is becoming marvelous; pears about half a crop, the Keiffer ranking first in productiveness; peaches none, but the trees that were so badly injured by the winter revived considerably and bid fair for future bearing; plums more and more uncertain, the black knot being the destructive factor in its cultivation; apples plenty during the entire season. The winter supply kept poorly, due to overripening on the trees, likely from lack of moisture in the soil.

COUNTY FAIR.

Our society, besides offering premiums at some of its regular meetings during the year, co-operated with the Richmond Fair and Races, having exclusive charge of all exhibits in the grain, vegetable, fruit and flower departments. The association granted all our members complimentary season tickets, made all collections and paid the premiums of the fair. This will lessen our annual receipt and disbursement financial statement, which it is necessary for our Society to furnish.

STRAWBERRY CULTURE.

Amateur, as well as professional, strawberry growers have experienced considerable difficulty endeavoring to supply in sufficient quantities the large home demand in this section of the North for this luscious fruit, especially during recent years. The length of the strawberry season has been considerably lengthened by early shipments of ripe berries from southern States, which are principally used as a luxury, yet the bulk of fruit consumed on our tables and for canning purposes, must necessarily be grown by local producers.

From observation the length of the ripening season in this locality is about twenty-one days. The average period of greatest fruiting during the past five years has been from the 25th to the 28th day of May. It is true, however, that most of the older varieties reached their zenith of productiveness between the 8th and 10th of June, indicating a change in the number and class of varieties grown under present cultivation.

From statistics furnished by J. S. Kuth, of the "State Line Fruit Farm," who is among the most successful professional fruit growers in this section, some idea may be obtained of the volume necessary for home consumption. The total output of strawberries the past season from his farm was about 1,500 bushels yielding on the market an average of \$1.84 per bushel, or a total of about \$2,760; to handle the same 48,000 quart baskets were used, at a cost of \$125. The total cost of picking was \$540, or an average of 1½ cents per quart. The largest number of bushels marketed in a single day was over 150, and the largest daily consignment to any one customer brought \$241.

In the propagation and cultivation of varieties, in connection with their adaptability and productiveness, essential qualities are sought that meet

the requirements necessary not only for shipping purposes, but to satisfy the tastes of the consumer. The Libo and Haverland are recommended for home use; the Staples and Warfield have proven satisfactory for canning and culinary purposes; while the Libo, Haverland, Lovett, Bubach, Clyde and Ohmer are unexcelled varieties for marketing.

The most promising new variety for general use is the Libo, being a perfect berry, of large size, fine flavor, handsome color, good for eating and canning and an excellent shipper.

Best results have been obtained in strawberry culture on clayey soils or on those formed from the disintegration of granite rocks, with land south to southwest slopes and sufficiently undulating to insure natural drainage. The mulch or liberal coating of straw applied in the late fall to the beds has proven essential to the protection of the plants during the winter months and during the summer by retaining the moisture through possible drouths as well as a medium for insuring cleanliness to the maturing fruit.

Respectfully submitted,

WALTER S. RATLIFF.

REPORT OF THE MONROE COUNTY HORTICULTURAL AND AGRICULTURAL SOCIETY.

The past year has been rather discouraging for Monroe County fruit growers. Strawberries were about the only fruit that was of much account. They were not as plentiful as some years but the quality was better than usual and prices were better accordingly.

Raspberries and blackberries were almost a failure on account of being winter killed. A few growers in favored localities had some berries and got better prices for their fruit than ever before. Gooseberries and currants were a fair crop; peaches and plums a total failure and apples a very poor crop. Very few persons sprayed their trees; those who did were well repaid for their trouble, and I predict there will be more spraying done next spring than ever before. Grapes were badly winter killed, though there was a fair crop where they had been protected.

Our Society has had a very pleasant and profitable year. We hold our meetings once a month at the homes of the members, and the social part of the meetings are worth all it costs. The dinner that is always served by the ladies is of the finest in the land. Our ladies have an enviable reputation of being the finest cooks in the county, and by the way, they generally turn part of each meeting into a cooking school.

Some of the subjects discussed during the year are as follows: "Is the Farmer Doing His Duty in Advancing Fruit Culture?" "When and How Best to Transplant Plants Without Detriment to Growth;" "What are the Farmer's Best Mortgage Lifters and Bank Account Feeders?" "The Education of Our Boys and Girls;" "The Woman in the Home—the

Old or the New Woman;" "How Can We Increase the Cheer and Comfort of Our Homes?" "Shall the Farmers Raise Their Own Seeds or Buy of Reliable Seedsmen?" "Floriculture, or How Can We Ornament Our Homes;" "Growing Small Fruit for Home and Market;" "Shade Trees, Kind, Cultivation and Benefit."

We held a fair October 5th, 6th and 7th and had a good exhibit, but the attendance outside of the members was very poor, which caused our balance account to be on the wrong side of the ledger. However, we had money enough in the treasury to pay off everything in full and have a little left. There was a big show come to town the first day of our fair and it was thought that was the cause of the slim attendance. Lithographed bills of long-tailed monkeys seem to have more attraction for most people than rosy-cheeked apples and golden yellow pumpkins.

The officers are: President, Ben Kirby; Vice-President, J. T. Eller; Secretary, Geo. P. Campbell; Treasurer, J. S. Dinsmore.

FIRST REGULAR MEETING
OF THE
Indiana Corn Growers' Association

HELD AT
INDIANAPOLIS, MARCH 7, 1900.

ORGANIZATION.

For a year or more prior to 1900 an Indiana Corn Growers' Association had been agitated by Mr. James Rily, S. B. Clore, H. F. McMahan and others.

The first steps toward organization were taken January 3, 1900, at a called meeting at the State House. A temporary organization was effected by electing I. Newton Brown, Franklin, President; James Rily, Vice-President; H. F. McMahan, Secretary and Treasurer. Committees on Constitution and Score Card were named.

FIRST REGULAR MEETING.

The first regular meeting was held at the State House Wednesday, March 7. Eighty or more persons were present; fifty became members of the Association. In addition to an excellent program, there was an exhibit of some of the finest corn grown in the State.

ADDRESS BY THE PRESIDENT.

I. NEWT. BROWN, FRANKLIN, IND.

"Corn is King" in Indiana. The organization of a corn growers' association, in this the day of combination for self-protection and advancement, is therefore not a matter of wonder. The only wonder is that the corn growers of this State have not organized years ago. The cattle breeders, horse breeders, swine breeders, wool growers, poultry fanciers, bee keepers, and horticulturists, in a general way, have for some time been

conferring for mutual advancement. And yet, important as all these phases of agriculture are, each is secondary to the corn-growing interests in Indiana.

The latest statistics at hand for this State, those for 1899, show that the production and farm products in Indiana were: Tobacco, 11,891,464 pounds, valued at \$590,400; honey, \$680,000; wool, 4,631,477 pounds, valued at \$1,140,400; potatoes, Irish and sweet, 5,277,237 bushels, valued at \$3,255,340; slaughtered animals on farm, \$4,795,639; poultry and eggs, \$6,980,000; oats, 36,801,186 bushels, worth \$9,300,296; fruits and garden products, estimated, \$9,840,000; milk, butter and cheese, \$17,180,000; wheat, 31,357,099 bushels, cash value, \$21,014,256; timothy and clover hay, 3,691,531 tons, worth \$40,600,800; corn, 121,246,804 bushels, worth in the market, \$45,374,041.

In 1899, the number and value of domestic animals in this State were as follows: Sheep, 1,330,121, valued at \$4,680,600; horses and mules, 63,259, worth \$25,120,100; swine, 2,905,432, cash value, \$20,210,124; cattle, all kinds, 1,158,158, valuation, \$35,174,340. These figures are from the bulletin just issued by Statistician Conner.

From these figures it is demonstrated that corn has a greater value than any other product of Indiana soil, and therefore "Corn is King." It leads any other single product by almost five millions of dollars. I observe, however, that little more than one page is given to the subject of corn-growing in the last report of the State Board of Agriculture. Corn is so important a factor in the agriculture of the State that any intelligent discussion and organization by corn growers is most fitting.

My father sought the best breeds of stock for his farm. He often said that the cost to feed and develop first-class stock was really less than that involved in the keeping of "scrub" stock. We will all agree that the best varieties of corn are no more expensive or difficult to produce than inferior varieties and that the harvest gives much better returns.

There has been great improvement in all departments of agriculture and stockraising in the last few years. There has been vast improvement in the quality of Indiana corn and the economy of its production. But the ideal has not yet been reached. Even the practical has not been reached, and that is the reason we are here to-day.

One of the results already brought about by this organization is advancement toward a standard of excellence by which the individual ear is to be judged. The committee appointed to fix the standard of excellence upon which the various points may be scored with accuracy approaching the scientific has done its work and its report has been published.

I do not suppose this Association will attempt to determine what is the best variety of corn. That is a matter determined largely by character of soil and ultimate use. Selection of variety and individuality oftentimes, in its final determination, as with the woman who kissed the cow, is simply a matter of choice. To attempt a single selection would be the "battle of the breeds" over again.

I think we may very profitably discuss a great many questions vital to successful corn growing, such as depth of breaking and subsoiling, fertilizing, time of planting, deep or shallow cultivation, plant, grain and cob development, corn shows and contests, and kindred topics.

I have had some success as a corn raiser, but I confess that I am a failure as a corn talker in this capacity. I am sure there are those here who are successful at either. I close by quoting the first and last stanzas of Whittier's beautiful "Corn Song."

"Heap high the farmer's wintry board!
Heap high the golden corn!
No richer gift has heaven poured
From out her lavish horn.

* * * * *

"Let earth withhold her goodly root,
Let mildew blight the rye,
Glve to the worm the orchard's fruit,
The wheat field to the fly.

"But let the good old corn adorn
The hills our fathers trod.
Still let us for His golden corn
Send up our thanks to God."

WELCOMING ADDRESS OF GOVERNOR MOUNT.

Governor Mount made a welcoming address, paying a high compliment to the farmers of the State, and to their importance in productive industries. He dwelt at length upon the importance of the State in its cereal productions, claiming that the multiplied uses to which the corn crops could be applied was destined to make that crop the leading cereal crop of the State. "Corn and grass," said the Governor, "is the basic foundation of live stock husbandry and live stock, the dairy and the poultry interest—the source of true prosperity to the farmer." In the discussion of this question he revealed a familiarity with the business of farming that could emanate only from one who had been a life-long follower of that vocation. His familiarity with the cultivation, growth and utilization of the corn crop at once placed him in touch with the audience. He stated that all his life he had been a grower of this cereal. No farmers are so fortunately situated as those located in the corn belt, and those possessing soil producing abundant corn crops. Great as is the value of the crop, only a little more than one-half its value is secured in the corn. On thousands of farms the by-product of stover is wasted. If this were properly utilized its value as forage for live stock would be more than

one-third the value of the corn. "We are wasting," said the Governor, "with a prodigal hand, the virgin fertility of our fields, here in the central West, by failing to utilize this great by-product and returning the refuse to the fields. Fewer acres should be cultivated in corn; more of the farm area kept in grass; more live stock kept on the farm, thus enabling the farmer to rest a part of his land and fully utilize all the crops grown. This method of farming broadens the opportunity for the man of thought. The science of breeding and rearing live stock, the science of feeding, the study of markets, broadens the possibility for success on the farm, and, at the same time, enables the farmer to return to the soil, through the medium of live stock, part of the plant food taken from the soil in the growth of crops. The farmer is more than the farm! The farmer should be master of the situation and should own the farm instead of being the servant of the same. Intelligence is needed everywhere, and especially in the future must intelligent management dominate the success of the farm. Farmers must be students of their business if they succeed. I cordially commend the noble purpose of this organization. We must understand the proper methods of successful cultivation of this important crop. We must especially study how to utilize the crop when grown. Already the wasteful method of growing large crops of corn, hauling the corn to market, burning the stalks, is apparent in depleted soil. There will be a diminished yield of crops unless more intelligent methods are adopted in Indiana among our farmers, and, in time, many farms abandoned as thousands are now in the eastern States. The prodigal methods pursued by farmers have occasioned alarm in the eastern States, and efforts are now being put forth looking to the reclaiming of this wornout land. It is to be hoped that in your organization this important question, which lies at the foundation of successful agriculture will be thoroughly and capably discussed, and I trust will be the beginning of an era of more intelligent farming in Indiana, and that the corn crop of this State will be utilized to the best advantage, both as relates to dollars and cents and immediate and soil fertility upon which to draw in the future. I congratulate you upon this meeting and trust that you will be enabled to form an organization that will be productive of much benefit to the farmers of our State. Let us bear in mind gentlemen that farming is not a mere drudgery, measured in success for physical effort, but one of the most difficult sciences, requiring diligent study and application to understand and master its forces, to secure the highest results that are to be attained in this noble calling."

CORN CULTURE AND ITS COMMERCIAL VALUE.

The following are some notes of the address made by Mr. E. S. Furz-
man, of El Paso, Ill., President of the Illinois Corn Growers' Association:

He said that he had raised forty-three crops of corn and spoke from long practical experience as well as a close study of corn. The largest crop of corn in the United States was in 1891, when 2,257,000,000 bushels were raised on 96,000,000 acres, but he believed that we would never have 96,000,000 acres in corn again, because more land is being used for something else, and much poorer land, formerly planted in corn, is not used that way now, it being demonstrated that to raise good corn we must have good land. That the good yield of 1891 was not very satisfactory is shown by the average which was only twenty-two bushels to the acre. Stock raising and a change of land to secure or preserve fertility is responsible in part for a smaller acreage of corn.

In the great corn belt, beginning in the southwest corner of Nebraska and taking in the northeast corner of Kansas, southern Iowa and northern Missouri, extending through central Illinois and narrowing through Indiana to a point in the Scioto valley, Ohio, contains about 47,000,000 acres of very rich land, and the time will come when the corn of this country will largely be confined to this belt. North of this corn belt they have the soil but not the climate, and south of it they have the climate but not the soil. Here the soil and climate are brought into perfect harmony for raising great crops of corn, and farmers want to stay here. The corn belt described is sixty to eighty and 100 miles wide at different points.

Farmers need a few more figures to be successful. How many farmers know the business of raising corn? He figured that an acre of corn contains 3,488 hills, and, at two stalks in a hill, 6,976 stalks. He thought that two stalks to the hill was thick enough to plant corn. On these figures he showed that the ears would only have to weigh five and one-half ounces each to make a yield of thirty-four bushels per acre. The 6,976 ears at five and one-half ounces each would make 38,368 ounces, which, dividing by sixteen, equals 2,398 pounds, and this reduced to bushels, by dividing by seventy, gives 34 18-70 bushels. He figured that it takes about a ton of earth to grow a hill of corn, or 1,000 pounds of soil to produce one of these five and one-half ounce ears of corn. If the ears weighed one pound each it is easy to figure in the same way that the yield would be 99 46-70 bushels per acre, and we don't raise it. A five and one-half ounce ear is but a nubbin, but the farmers don't realize how many stalks and hills produce no corn.

Next October a few days before husking go into the field and analyze a row of corn. You will want a tablet, pencil and scales. By the time you have gone over twenty hills you may be ready to go home disgusted. You will be surprised to find that about one-fourth of the stalks have not produced anything. The trouble may not be lack of fertility of the soil but lack of pollenization of the ear. If we are going to be scientific farmers we must attend to that. Before raising his 160 bushels of corn on an acre, Mr. Furzman figured it out that 13,965 stalks to the acre, each stalk bearing an ear weighing fourteen ounces, would be required to

produce 174 bushels of corn on the acre. He drilled the corn in ten inches between the stalks and missed his estimate only 14 bushels, raising 160 bushels.

What we want is to go higher than the average; we must be after the possibilities of life. To raise 190 bushels of corn on an acre is no greater feat than to produce and train a horse to go in 1:59.

The corn needs greater fertilization or pollenization. The slick, smooth ears lack power to pollenize. The period of pollenization is about fourteen days, but it is often cut down to six to eight days, when you see the tops of the corn turning white in the burning sun. What we want to do is to improve the filling out of the ear and hence increase the yield of corn, by extending the time of the pollen until it can fall on all the ears. This can be done by crossing two varieties of corn strong in pollen, and with the time of the pollenization of one variety extending a few days beyond the time of pollenization of the other variety.

Mr. Furzman would not undertake to raise a big crop of corn without crossing the varieties. He argued that the same principle applied to live stock and that the best beef type of cattle is secured by a cross of breeds; that it applies to horses, the best horses being produced by a cross of thoroughbred and common horse; and that in horticulture the very finest double flowers and most valuable varieties are produced by a cross of two good varieties. But he would not follow up this crossing beyond the first or possibly the second cross, as then the result would be less and less satisfactory. He would try to get a difference of four to six days in the period of pollenization of the varieties of corn used, and he would plant the very best seed.

The problem for the farmer is, first, to produce a fine article; second, to produce it cheap, and to market it cheap. To improve in his business he must know the cost of crops. In every other line of business the men figure a certain per cent., sometimes ten per cent., to add to the cost of production, for the cost of marketing. The cheaper they can sell the more they can sell, but does the farmer study this principle? Does he know what his corn costs him and what to ask for it, and sell it when he gets to or above that price, so that he can make a good profit on it? How can he know when to sell his corn unless he knows the cost of it? When he can get the cost of his article and a good profit, then is the time to sell. The moment any article gets too far above the cost of production, the consumer don't want it, and the demand is lessened. The consumer begins to economize. The farmers have killed their market in holding their grain for big prices. The speaker related that his former idea about the price of grain was to get all he could for it, and spoke of not knowing any better than to refuse fifty-four cents a bushel for his corn and then holding it over to finally take twenty-seven cents a bushel.

Mr. Furzman figured the cost of an acre of corn as follows: Plowing, \$1; discing, 22 cents; harrowing, 14 cents; seed, 9 cents; planting, 23 cents;

harrowing, 12 cents; plowing three times, \$1.25; husking, \$1; shelling, 60 cents; hauling 60 cents; total for labor, \$5.25.

To this should be added the rent, or, if the farmer owns his land, 6 per cent. for interest on his investment of \$80 per acre, which would equal \$4.80, and 40 cents per acre for taxes, making a total cost of \$10.45 per acre. Counting in a 10 per cent. profit, \$1.04, he should get \$11.49 for the corn raised on an acre.

The farmer should pay more attention to learning and experimenting on his farm instead of leaving this work to the agricultural college. Let him try a cross of varieties of corn every year. Ten acres is enough to plant in that way and then he will know the result for himself. Let him plant perfect corn on the worst places in his field and note the increase in the yield.

SOME OBSERVATIONS ON THE CORN PLANT.

W. C. LATTA.

We owe much to the corn plant, for corn is the king of crops in Indiana.

Its attractiveness, sensitiveness, plasticity and wide range of adaptation to human needs make the corn plant an object of interest alike to the farmer, student, artist and philanthropist.

I. Its Usefulness.—In point of general utility the corn plant stands at the head of the list of field products in Indiana. Its great yield per acre, its general adaptation to Indiana soils and its multiplied uses as food for man and beast, all combine to give it first place. Its value is, however, not yet fully appreciated. We waste by failure to harvest or by imperfect methods of feeding probably one-half the food value of the corn stover, which good feeders consider worth \$5 per acre. If these statements are even approximately correct, the loss from waste of corn stover alone in Indiana must be over \$8,000,000 per year. If we assume this loss to be only \$5,000,000, which is certainly below the truth, it would involve an annual average loss to each county in the State of over \$50,000. The loss, therefore, from this source alone to each county in the State is more than ten times as much as the State appropriation for farmers' institutes.

II. Its Beauty.—From the time the first green blades appear and the corn plants begin to grow in green, straight rows across the field, they are objects of interest and attraction. Who has not watched with interest and admiration the marvelous development of the young corn plants

under the influence of the genial sunshine, the refreshing showers and the kindly care of the husbandman? What farmer boy has not admired his growing charge while listening to the low music of the rustling corn leaves in the summer breeze? Who has not watched with genuine pleasure and artist spirit the appearance in quick succession of feathery tassel, scarlet and yellow "silk," protruding shoot and finally the full corn in the ear, turning golden in the mellow September sunlight? What man of reverent mood and philanthropic spirit has not felt while admiring the golden ears of corn, how abundantly they answer the prayer, "Give us this day our daily bread?"

III. Its Variableness.—Probably no plant that the farmer grows shows such a wide range of variation in form, size, time of maturing and appearance as the corn plant. The stalks vary in height from two to twelve or more feet and the ear from one to fifteen inches in length. The ears vary in number from nothing to a half dozen on the same stalk, and the proportion of ear, as shown by experiments at Purdue, from 25 to 50 per cent. of the weight of the entire plant. These differences adapt the corn plant to a wide range of climate, soils and purposes.

IV. Its Plasticity.—Perhaps no other plant is more easily modified to suit the purpose of man. Any variety may be made taller or shorter, earlier or later, better or poorer, by selection. Thick planting reduces both the size and per cent., by weight, of the ears. Late planting, while reducing the yield, hastens the maturity. This is one of the compensations to those who must sometimes plant late. The small early kinds of corn are less affected by the midsummer drouth than the large and late varieties. As a general rule the quality and yield of a variety of corn are reduced by change of locality. This is largely due to the fact that the plant does not find its new surroundings so perfectly adapted to its needs as the old. This is especially true of the improved varieties of corn which are produced by methods and conditions far superior to those of the majority of farmers. It is therefore generally better to develop the home grown, acclimated varieties than to import others from remote sections and very different climatic conditions.

V. Its Improvement.—The extreme sensitiveness of the corn plant to its environment and its marked response to intelligent care and improved conditions render improvement of corn an easy process to intelligent patient painstaking men who have good corn soil. The steps in the improvement of corn are: (1) Continued selection from year to year of the type,* which makes the nearest approach to the ideal in earliness, form, size, yield, quality, proportion of ear to stalks, etc.; (2) the choice of a good corn soil in which the plants can develop to the greatest degree of perfection; (3) intelligent culture which tends to secure the conditions for the proper chemical, physical and biological activities of the soil, the full

* To secure the desired type, crossing of the existing varieties may sometimes be necessary.

quota of sunlight and the freest range of corn roots that the plants may be abundantly nourished.

The particular line of improvement will depend on the local conditions. To illustrate: If the soil is a good one for corn, the efforts will be directed (1) to securing an ideal type of corn by means of breeding (if necessary) and continued intelligent selection; (2) to securing the ideal soil conditions for the perfect development of the corn plants. If, on the other hand, the soil is not ideally adapted to corn—especially if it is subject to mid-summer drouth—the aim should be to select the particular type of corn which will do best under existing unfavorable conditions which can not be controlled. In the last analysis this really means, in any case, (1) securing the best possible conditions as to soil and its treatment, and (2) the choice of a type that will be most perfectly adapted to these conditions.

CONSTITUTION OF INDIANA CORN GROWERS' ASSOCIATION.

At the January meeting, H. F. McMahan, Fairfield, Ind., J. H. Gwaltney, Poseyville, Ind., and W. H. Hart, Portland, Ind., were appointed a committee to draft a constitution. The committee recommended the following articles, which were adopted by the Association:

ARTICLES OF ASSOCIATION.

Article I.—This Association shall be known as the Indiana Corn Growers' Association, and its object shall be to advance the agricultural interests of the State.

Article II.—The officers of this Association shall consist of a President, Vice-President, Secretary and Treasurer, and an Executive Committee, consisting of the President, Vice-President, Secretary and Treasurer.

Article III.—The duties of all officers shall be similar to the duties performed by officers of like associations.

Article IV.—The officers shall be elected at the annual meeting by a majority of the members present, or for one year, or until successors have been elected.

Article V.—The regular annual meeting shall be held at such time and place as the executive board shall designate. Special meetings may be called by the President on two weeks' notice to all members by card.

Article VI.—Any person interested in corn growing may become a member of this Association for one year upon the payment of fifty cents into the treasury.

Article VII.—At each annual meeting the President shall appoint a committee of three whose duty it shall be to conduct a scoring school, examine all applicants, and award those who pass a satisfactory examination expert judges' certificates. Certificates to be signed by President and

Secretary. For each certificate granted, the applicant shall pay \$2 into the treasury of the Association.

Article VIII.—These articles may be amended at any regular annual meeting by a majority vote of paid-up members.

SCORE CARD OF INDIANA CORN GROWERS' ASSOCIATION.

Mr. James Rily, of Thorntown, Prof. W. C. Latta, of Lafayette, and S. B. Clore, of Franklin, had been appointed a committee to arrange a score card by which to select seed corn and for the use of judges at corn shows. The following is their report, which was adopted without amendment:

STANDARD OF PERFECTION.

A perfect ear of corn in the northern third of the State should be nine inches in length; in the central third, ten inches; in the southern third eleven inches. The diameter of the ear should be equal to one-fourth of the length. The ear should yield 90 per cent. of grain by weight.

The ear should taper slightly, approaching the cylindrical to near the point. It should be well filled out at both ends, with the rows regular and straight.

Disqualifications: Red cob in white corn, or white cob in yellow corn.

Score card for ear corn:

1. Uniformity of variety and exhibit.....	10
2. Purity of color in both grain and cob.....	7
3. Condition of marketableness.....	10
4. Well filled out at ends.....	20
5. Perfection and uniformity of grain.....	8
6. Length of ear.....	5
7. Circumference	5
8. Straightness of rows and regularity of grain.....	10
9. Per cent. of grain.....	25
<hr/>	
Total	100

The Association then adjourned until 1:30 p. m.

AFTERNOON SESSION.

The afternoon session began with an illustrated address on—

TYPES AND VARIETIES OF INDIAN CORN.

PROF. C. S. PLUMB, LAFAYETTE, IND.

Indian corn is an American plant and was grown upon this continent before the discovery of America by Columbus. This has been demonstrated to the satisfaction of botanists generally. Indian corn was not grown in Europe prior to Columbus's discovery, while charred ears have been found in Indian mounds and burial urns, dating back into the time of prehistoric man in this country.

Originally, it is probable that corn was of one type, although we have no absolute proof on this point. However that may be, we to-day have many so-called varieties of corn, and these varieties may all be grouped, to a reasonable degree, in different types. These types may be given as follows: Dent, flint, soft, sugar, pop and pod.

Dent corn represents that class which is most extensively grown in the United States and is the common form of the great corn belt of the central West. It is characterized by having much more length than breadth, and on the tip of each kernel is usually found more or less of an indentation or roughness. Where a section is made lengthwise through a kernel of dent corn, there will be seen to be a hard substance on the sides of the kernel, while the top and center is more or less filled with a white, starchy material.

Flint corn is shorter in the kernel usually than the dent, and is surrounded on the edges and top with a hard layer, while the starchy matter of the kernel occupies a much smaller space in the center than it does in the dent type. Corn of the flint type belongs to a hardier class than does the dent, and it is mainly grown in New England and the northern corn sections of the United States and the British Dominion. Varieties of the flint type mature where the dent will not develop the ear to any material extent. Consequently it is best suited for the most northern region adapted to corn growing.

Soft corn is a type that is characterized by having a kernel fairly large in size, something like the flint corn in shape, but made up mainly of starch, with almost no hard substance, such as is found in the flint corn. This is the type of corn that has been found in the Indian mounds and burial urns and is grown at the present time by the Indians of Arizona,

New Mexico, and old Mexico in particular. While this variety will mature in the central United States, it is not regarded as valuable a type as the two preceding and it lacks the hardness of the dents and flints.

Sugar or sweet corn is of a different character from the other three types in having a kernel which is usually much longer than broad, and it contains more sugar and gummy material than other types of corn, and it has a peculiar translucent hard exterior of the grain, which forms a considerable percentage of the same. Sugar corn makes its sweetest and best development in the colder portions of the corn belt, and in the far South it is so seriously injured by corn worms as to make its successful culture very difficult. Plants of this type are usually rather small and some of them mature in less than 90 days.

Pop corn is a smaller type of the corn plant, producing small ears with kernels usually roundish and sharp pointed in form, composed of a very thick and hard substance, which when exposed to great heat rapidly expands and bursts into a white, fluffy substance. Pop corn grows more satisfactorily in the northern part of the corn belt, and where the flints thrive, and is not used or practically known at all excepting for human consumption as popped corn. There is a considerable range in the character of the pop varieties, and one type, the Dwarf Golden pop, matures at from eighteen inches to two feet high and produces several miniature perfect ears in the neighborhood of one and a half to two inches long, and covered with tiny yellow kernels.

Pod corn is a very peculiar type, only rarely grown and seen, and then produced simply as a curiosity. Whether it represents a sprout reverting back to the original form of Indian corn, is problematical. Generally speaking, each kernel on an ear of pod corn is surrounded by an independent husk and then the entire ear is also covered by a number of husks, as in common corn. Pod corn is found as both dent and flint types.

The Indian corn plant produces such a large number of blossoms on what is to become an ear, and produces its pollen to such an extensive rate that different varieties, when located near each other, readily cross with that matured somewhat within the same periods of time. In fact, it is stated that two varieties of corn situated a mile apart will cross fertilize. In experimental gardens or in localities where several types are grown, one may occasionally find ears with examples of different types of kernels all on one ear.

Corn varieties differ largely in the size of the ear and plant and the number of rows of kernels upon the ear. The rows are always in pairs and with the flint variety eight and twelve rows are more common than a greater number. With the dents, we find the rows to number from twelve up to twenty-four, although sixteen rows are quite common with this type. The flints have the smallest, longest ears, generally speaking, while the dents represent the largest ears in diameter and size.

The color of corn has rather a wide range, yellow and white being the

most common, although the soft varieties show many beautiful variations in color, ranging from white to black, with different shades of red, blue and pink. If we take the white or yellow for our common dent corns, we find they possess no material difference from the feeding standpoint. I think, however, that for human consumption the flint corns furnish a better quality of corn meal for table use, having a richer flavor than do the dents. A person who has once been used to using corn meal for the table, made from flint corn, will never willingly go back to the use of dent corn.

If one will make a careful study of his soil and conditions, he should be able to grow a variety of dent corn that will prove a very productive yielder and such as will meet all the necessary requirements of the farmer. In order to secure the best results, however, it will be necessary to constantly select seed with considerable care and keep the crop up to a high standard of perfection. In my opinion, by practicing judicious selection, there need be no difficulty in a farmer growing the same varieties many years without deterioration. In fact, the varieties should improve rather than deteriorate.

[The speaker, in discussing this subject, showed the audience drawings of cross sections of the different types of corn and also showed samples of corn of various forms, to illustrate his talk.]

THE RELATION OF UNDER-DRAINAGE TO CORN GROWING.

The following paper was read by Mr. J. J. W. Billingsley, editor of the Drainage Journal, Indianapolis. Mr. Billingsley is a farmer of long experience and is a recognized authority upon tile drainage. The article is as follows:

Soils adapted by their fertility and climate to growing corn need to be open, porous, warm, deep and sufficiently supplied with moisture. The corn plant is a vigorous grower, extending its roots in all directions through the mass of soil made open and porous by cultivation, or otherwise, for the needed supply of food and moisture. The distance to which corn roots will penetrate the soil is not generally well understood. It is quite commonly thought that ten or twelve inches in depth and three or four feet laterally covers the extent of their penetration, when in fact four or five feet will hardly embrace the distance which they will go if the soil conditions are favorable.

This fact emphasizes the need of securing in some way a porous, mellow condition of the soil and subsoil to a depth of three or four feet, to promote the most successful growth of the corn crop, which can not be secured in any way so effectually as by deep under-drainage, the advantages of which may be in part mentioned as follows: By under-drainage the excess of water or water which fills the spaces between the particles

of soil is afforded a ready passage through the soil to an outlet through the drain. The water falling out of the soil spaces is followed by the air. The water in its passage through the soil and subsoil forms innumerable little channels exposing a vast amount of surface upon the soil particles which the action of the air serves to further divide.

Another advantage offered by a porous soil is the presence of air so necessary to plant growth, which fills the spaces between the particles of soil. The roots of corn will not penetrate much below the line of sufficient aeration, whether the line be twelve inches or four feet below the surface. The effect of excluding the air from the roots may be plainly seen in the yellow blades when the soil is saturated or full of water for two or three days during a long continued rainfall. In fact the plant is damaged more or less if the air is excluded from the roots for twenty-four hours or more. The presence of air in the soil effects chemical changes of vast importance in the elaboration of plant food. It follows, then, that if the air is practically confined to the depth penetrated by the plow or cultivator the roots will be circumscribed in their effort to penetrate the subsoil to greater depths and has a less mass of soil from which to draw food in sufficient quantity to promote vigorous growth. In a dry time the soil at a depth of three or four feet is cooler than the air. When the water vapor in the air is brought in contact with the cooler soil particles it is condensed and absorbed by the soil, the same as the dew forms on vegetation at the close of the day. Hence it follows that soils made sufficiently porous by deep under-drainage absorb moisture from the air and conserve it for the use of the corn plant or other crops. Still further, this porous, mellow condition of the soil and subsoil allows the water of rainfall to enter the soil at or near the point where it falls, which is absorbed rapidly. If this porous condition extends to the depth of three or four feet, a large quantity of water will be taken up and held by the soil particles before any will pass out through the drains. Hence deeply drained land conserves the moisture so greatly needed in growing a maximum crop. In this connection it is perhaps well to remark that the quantity of water transpired from the blades and stalk of the corn plant during its growth to maturity is estimated at 300 pounds to one pound of dry matter. That is, if a stalk of corn, ear and all, after being fully matured, is dried until no water remains, except it be chemically combined, weighs one pound it is estimated that this one stalk has evaporated during its growth to perfection 300 pounds of water. If the experiments upon which this estimate is based are approximately correct, what a vast amount of water is essential for the growth of one acre. In this connection it is important to mention the fact that the water taken up by the corn plant is almost, if not entirely, taken from the soil by the roots, out of the water adhering to the soil particles, and this water is the channel through which the nutriment for the plant is received.

It is a well recognized fact that next to temperature the water supply

is the most important factor in promoting the vigorous growth and full maturity of farm crops and of corn especially, excepting only the soil fertility. These facts intensify the importance of conserving soil moisture, in a deep, mellow, porous soil, which can only be secured to perfection by deep, thorough under-drainage. It is well known also that a warm soil is essential to the growth and maturity of corn. The increased temperature effected by drainage ranges from six to ten degrees Fahrenheit, the difference depending upon the kinds of soil. In clay loam soils well under-drained the increased temperature approximates eight degrees when compared with a like soil not under-drained. An increase of eight degrees of temperature makes a marked difference in the better germination of the seed and the early rapid growth of the plant, and promotes a more vigorous growth throughout the season, until the crop is fully matured. The drained soil is ready for the plow several days in advance of the undrained soil, and the crop is less liable to be damaged by the early frosts of the fall season.

The capillary action of the soil which causes the water in the soil and subsoil to flow to the surface where it is quickly evaporated during the crop growing season is restricted to a very considerable extent by the increased porosity of the well drained soil. Close, retentive clay soils not under-drained are compact together, increasing the capillary power, to a great degree, to remove both the excess of water which may be in the spaces and also the water adhering to the particles of soil. Besides, the removal of the water by capillary action is a cooling process taking up the heat absorbed by the surface soil, from the rays of the sun, to vaporize the water. Those of us who have had wet shirts in the harvest field, know how the heat of our bodies has been drawn upon to dry them and we are familiar with the method of cooling the water by wrapping the jug with a wet cloth. The same is true of the surface soil, from which any considerable quantity of water is evaporated from the surface. In addition, soils which are dried by rapid evaporation become hard, compact and cloddy when broken, and the corn grown with such a soil condition suffers serious damage in dry weather for want of sufficient moisture.

The wise husbandman in the cultivation of his land keeps steadily in view the increase of fertility. It is greatly to the credit of any farmer, if it can be said of him that "his land grows better crops than they did when he first took them in charge." But it is sadly true that much of the land in cultivation in this State does not grow such crops of corn as it did when brought into cultivation in its virgin condition. It is quite common to reckon the production at forty or fifty bushels of corn per acre, when it would be nearer the mark if they said twenty-five, thirty and thirty-five bushels. This falling off in production is attributable to several causes. We mention one—the chief cause—which is the surface washing of the land which has been going on since it was brought into cultivation, a period of forty, fifty or sixty years in many instances. Every heavy

rainfall in all these years has taken from the soil the humus incorporated into it by the decay of vegetable matter in the ages past. This surface washing carries away the fine particles of soil, the refuse of decaying vegetation, the elements of fertility brought to the surface by the capillary action of the soil and that which is brought down to the soil by rainfalls, and the most valuable ingredients of the manures and fertilizers applied to the soil, which is witnessed by the many little darkly dyed rivulets and tiny streams flowing into the larger streams never to return. The decline in the soil fertility of millions of acres of farm lands is due probably more to surface washing than to the crops which have been grown upon lands not under-drained. The process of cultivation is somewhat as follows: From five to seven inches of soil is turned in the spring, planted to corn, cultivated and washed by the rains, the crops gathered and the year following the same depth of soil is turned over to cultivate and wash the other side, and so on, washing one side and then the other for forty or fifty years with an occasional change to some other crop. Is it any wonder that our clay soils, not under-drained, are so cloddy and sad, and oftentimes sour, and make such a poor return for the labor expended upon them?

In calling attention to this great waste of fertility, we do so for the reason that it may be in most part prevented by thorough under-drainage, which renders the soil open, allowing the water to pass down through the soil and subsoil to the drains as above indicated, thus securing to the soil this waste of fertility. In the light of these facts, and we believe them to be true beyond question, we conclude that high or rolling lands as well as level lands, if not drained by underlying strata of sand or gravel, should be thoroughly under-drained in order to secure the best soil conditions to grow maximum crops of corn.

It is true, however, that under-drainage will not do all that is required, for withal there will be a need of the mixture of brains in the business. But the soil conditions affected by thorough drainage will lay the foundation upon which to build for the most satisfactory results in corn growing. We believe it possible to thus improve much of the land in this State now largely devoted to the growing of corn so as to double the corn crop with less expenditure of labor, after the land is drained, than is now required, if managed intelligently.

In conclusion we mention one instance out of hundreds which might be referred to in proof of our conclusions: The late John Johnson, of Geneva, N. Y., the pioneer of tile drainage, on this continent, began the work of under-draining his lands in the thirties of this closing nineteenth century—over sixty-six years ago. His land was gently rolling, with a close, retentive clay soil. Before draining he had a crop yield of wheat averaging about twelve bushels per acre. The sturdy, intelligent Scotchman saw clearly that such crops were not sufficiently remunerative, hence he determined to under-drain. Being familiar with the effects of drainage upon the soil in his native land, he readily entered into the work, which

he did as thoroughly as his past experience and knowledge would allow. It required years to complete the undertaking, his means being limited, but he perseveringly continued the work until it was done. After the land was under-drained, with intelligent management, he had a crop yield from year to year of thirty-five to forty-two bushels of wheat per acre—growing other crops of like excellence. It is not claimed that tile drainage wrought this change entirely, but it was the basis upon which he built to make the soil and applied fertility available. It did secure to his soil the full benefits of the manures and fertilizers applied; it did open up to the roots of his farm crops an underlying mass of earth rich with fertility and made the fertility available for plant growth; it did provide a deep, mellow under-soil for the roots of his crops to penetrate in all directions for plant food and moisture; it did prevent the surface washing of the land in most part and saved to the soil the fertility brought down out of the air by each recurring rainfall; it did restrict to some extent the capillary action of the soil and conserve the water or moisture for the use of the growing crop; it did remove the excess of water out through the drains; it did give a circulation of air through the soil so necessary to plant growth; it did increase the temperature of the soil, insuring a better germination and continued growth of his crops; it did enable him to plow sooner and cultivate his crops with much less labor; it did in a large measure insure a remunerative crop every year, whether the season was favorable or unfavorable. Fifty or more years have gone since these lands were brought into such a high state of cultivation, and all the while they have been growing maximum crops, and we are credibly informed that they have now an annual rental value of \$10 and \$12 per acre.

If any of you who are present would like to reap a corn crop yielding from seventy-five to 100 bushels or more per acre, and if you have not under-drained your land needing this improvement, see to it that you improve your basal soil conditions, open up a farm underneath the one you have been turning and washing for forty or fifty years. In failing to grow maximum crops every season you have been blaming the good Lord without reason. This is an age of expansion. Catch the spirit of the age, and reach out and down deep after soil fertility, which has heretofore been unavailable by thoroughly under-draining your land. Then will the winter of your discontent be made glorious summer and your harvest of maximum corn crops be made a season of rejoicing.

THE ADVANTAGES OF THE SCORE CARD IN JUDGING CORN.

JAMES BILEY, THORNTOWN, IND.

The score card is a numerical division of the ear of corn from the standard of perfection, or 100 points, and is divided into ten sections, a

special value being placed on each division, according to its importance to the general conformation of the ear of corn, its constitutional ability and its commercial value. In addition to the detailed description, it describes a perfect condition of each point and the detailed description. It also describes objectionable conditions. The successful use of the score card is the ability to place a proper and correct valuation on each point.

The score card stands in the same relation to the corn grower as the questioner to a class of students. It is constantly asking the question, Why? There is no doubt but that the score card is far superior to any other method ever introduced for instructing growers of corn in the art of judging. If of so much value as an instructor, is there any doubt as to its practicability? If corn growers will unite in their State and county associations and study how to judge corn, uniting on a maximum and minimum cut for the different imperfections, entire satisfaction can not fail to follow its use in the show ring. As an instructor it has no equal, and when once you enter into the study, you will readily comprehend its advantages over all other methods or systems.

[Mr. Riley's paper was illustrated by actual scoring of a sample of corn.]

OUR CORN PRODUCTION AND EXPORTS.

J. G. KINGSBURY, EDITOR OF INDIANA FARMER.

Your program committee kindly allowed me to select my subject, and you can not therefore lay the blame upon them for the dry array of figures I am about to present you.

In the numerous tables of statistics prepared under the direction of the United States Department of Agriculture, those relating to our two great cereals, wheat and corn, rank, next to cattle, highest in values and therefore in importance. The reports classify cattle separately from cows, and give the value of this greatest of our agricultural products for 1899 at \$637,931,135; but next to this comes corn, the value of which that year is set down at \$552,023,428. Next in the list in value was horses, \$571,074,813; then cows, \$474,233,925; then wheat, \$392,770,320. Cotton follows at \$319,491,412, and then hogs, \$170,109,743; sheep at \$107,607,530, and mules, \$95,963,261.

The comparison serves to show the high rank and vast importance of King Corn, and abundantly justifies the organization of a corn growers' association in this, which is one of the principal corn-growing States.

The total yield of corn for the entire country, according to the reports

for 1898, was 1,924,184,660 bushels. This was the seventh largest yield in thirty-three years. The largest yield was that of 1896—2,283,875,165 bushels. The next in 1895—2,151,138,500; next in 1889—2,112,892,000 bushels. Other big yields were those of 1888, 1,987,790,000; 1895, 1,936,176,000; 1897, 1,902,967,000. The smallest yield in the past ten years was that of 1894, 1,212,770,000 bushels.

The big corn States as given in the last published report, 1898, are, in their order of yield, Iowa, 254,999,000 bushels; Illinois, 199,959,000; Nebraska, 158,754,000; Missouri, 154,731,000; Kansas, 132,942,000; Indiana, 129,154,000; Texas, 105,336,000; Ohio, 102,828,000; Kentucky, 85,177,000; Tennessee, 76,467,000 bushels. All the other States gave yields below 50,000,000 bushels each.

The average yield per acre as shown in the tables is a surprise to many western corn growers. Bleak and rocky Maine shows 40 bushels per acre, New Hampshire 41, Vermont 43, Massachusetts 40, Connecticut 37, New Jersey 37, New York 33, Pennsylvania 37, while our rich western soil shows like this: Iowa, 35 bushels, Illinois 30, Indiana 36, Michigan 34, Kentucky 37, Missouri 26, Kansas 16, Nebraska 21, California 24 and Oregon 26.

If this Association can, within five years, bring the average yield of Indiana up to that of the New England States, it will have accomplished a grand result and amply rewarded the originators of the movement.

The greatest average yield of the principal corn growing States, since 1894, was in 1898 for Indiana, 36; 1896 in Illinois, 40.5; and the same year in Ohio, 41; Michigan, 38; Wisconsin, 37; Iowa, 39; Nebraska, 37; California, 37; Kansas, 28 bushels. Missouri's best year was in 1895, 36 bushels.

The best prices during the five years from 1894 to 1898 were in 1894, 45.7 cents. The average price in 1898 was 28.7 cents; in 1897, 26.3 cents per bushel.

The highest average prices in 1898 were received in the New England States, where they ranged from 44 to 64 cents. In New York the average was 43 cents, while in Kentucky and Ohio it was 27 cents, in Indiana 25 cents, in Iowa 24 cents, Kansas 27 cents and in Nebraska 22 cents.

The figures regarding the exports of corn are of full as great interest as those relating to production. The eastern States export almost no corn, and even New York State sent away less than half a million of the 15,671,000 bushels she grew. Pennsylvania exported 1,213,000 bushels from her 45,190,000 of that year's crop.

The largest corn exporting State is Illinois, 79,983,000 bushels; next Iowa, 76,499,000, then Nebraska, 50,801,000, Indiana 42,521,000, Ohio 22,622,000, Kansas 21,254,000, Texas 15,800,000, Tennessee 13,764,000, Kentucky 11,073,000, and Missouri 10,831,000.

It is interesting also to note the destination of this great crop after it leaves our shores, and the increasing demand for it in different lands.

In 1894 the total value of our corn exports, including meal, was \$9,981,000; in 1895, \$15,298,000; in 1896, \$38,490,000; in 1897, \$54,989,000, and in 1898, \$75,962,000. With the exception of 1895 the increase in the foreign demand has been constant and rapid.

As to destination, it appears that the United Kingdom took \$29,580,758 worth of our corn in 1898; Germany \$14,171,961; the Netherlands, which is Dutch to us, \$7,141,473 worth. Canada took a little over \$7,847,394 worth. Next in order is Denmark, with \$5,971,615 worth; then France, \$3,985,687. She must do better than that this year, or we'll be sorry we made such an exhibit of corn as we intend doing. Then comes Belgium, with \$3,080,051 worth. All corn importing nations other than these named took but insignificant amounts.

During the five years in question, Great Britain took 43.5 per cent. of our corn exports, and Germany 17.15 per cent.

Of corn meal, Great Britain took an average of \$344,081 worth per annum, or 36.28 per cent. of our total meal export. The British West Indies took 23.94 per cent. of it, and Canada 11.24 per cent.

The demand from Germany has varied greatly from year to year, and we are unable to account for the fact. The average for the five years was in value \$7,237,505; in 1894, \$5,339,631; in 1895, only \$1,672,539; in 1896, \$5,121,573; in 1897, \$9,881,821; and in 1898, \$14,171,061. Our German friends are evidently learning to like mush and corn bread better than formerly, or else, and that is our fear, they have learned to use the corn in place of malt for their lager beer.

If they will only try the recipe we use for making corn bread they will find a far better use for our corn meal than the one just alluded to. Here is the formula for the best corn bread that has been made at our house, a bread that is good enough for Queen Victoria, the Emperor Wilhelm, Wm. McKinley, or any other potentate:

One teacup wheat flour, $\frac{1}{2}$ cup corn meal, 2 tablespoonfuls sugar, 1 scant teaspoonful salt, 1 teaspoonful baking powder, 1 cup milk, 1 egg, 1 tablespoonful butter, melted. Sift together all the dry ingredients, then add the well beaten egg and milk, and lastly pour in the butter, stir, and bake in a well greased pan. Eat while hot.

Inasmuch as this first convention of corn growers is composed mainly of Indiana growers, it is proper to pay particular attention to the corn product of our own State. We will therefore quote some interesting figures from the 1898 report of Statistician Hon. J. B. Conner. In this report it appears that the total area in corn for the year named was 3,915,131 acres; the total yield 145,501,404 bushels, and the average yield was over 37 bushels per acre. The area for 1898 was 186,534 acres less than for the preceding year, while the total yield was 20,002,003 bushels greater.

The average yield, it will be noticed, is considerably greater than that given by Uncle Sam's report. This could hardly be due to the State pride

of Mr. Conner's reporters, since the Government relied upon local reporters also. It is an important question, and one that should be explained if possible, in a way to throw no discredit on the work of either national or State officials. It is probably due to the county pride of the township trustees, who make up Mr. Conner's figures, that the estimates are higher than those of the Department reports. It would be natural that each trustee should desire to see his own county rank well with others, especially those adjoining, and also that he should take his figures from the best farmers.

The largest acreage in any one county in 1898 was 103,850 acres, in Benton County, and the yield 4,154,000 bushels, with an average of 40 bushels to the acre. The counties with next largest acreage are as follows, in order named:

<i>County.</i>	<i>Acres.</i>	<i>Bushels.</i>	<i>Ave.</i>
Tippecanoe	102,065	3,766,405	37
White	83,379	2,584,749	31
Montgomery	73,640	3,608,360	49
Vigo	72,427	2,390,091	33
Newton	71,608	2,431,672	34
Delaware	68,517	2,740,680	40
Warren	68,174	2,590,612	38
Jasper	67,372	2,425,392	36
Madison	67,080	2,884,870	43
Clinton	64,890	3,049,830	47
Spencer	64,472	2,256,520	35
Knox	64,052	2,818,288	44

The counties producing the largest average yield are the following, in the order named: Howard, 50 bushels; Montgomery, 49 bushels; Clinton, 47 bushels; Johnson and Knox, each 44 bushels; Madison, Noble and Rush, each 43 bushels; Kosciusko, Marion and Vanderburgh, each 42 bushels; Miami, Steuben, Hancock and Henry, each 41 bushels; Benton, Blackford, Delaware, Fulton, Grant, Hendricks, Porter and Sullivan, each 40 bushels.

If the products of our corn fields had been 100 bushels to the acre, as our enthusiastic James Riley and some others maintain it should have been, the total product for the year 1898, instead of being 145,501,404 bushels, would have reached 391,513,100 bushels, over 246 millions more than it was.

To attain such grand results as this is the purpose of this newly organized association. May its efforts be crowned with success.

SOME MISTAKES IN CORN GROWING.

E. H. COLLINS, CARMEL, IND.

[A talk given before the Indiana Corn Growers' Association, March 8, 1900.]

The first great wrong to the corn crop is almost universal recklessness in selection and care of seed. Many are in the habit of planting crib seed, and generally secure a fair crop. But for corn to grow is not enough. It should grow strong. Many farmers dread a few days of cool, damp weather soon after planting. This dread implies bad seed. That is, seed with low vitality. The result is that the starch sours and the germ if started at all will make a short, puny effort and worms are attracted to it, and we blame the weather and the worms. The only way one can tell certainly whether fire-dried seed is much the best or not is to plant it side by side with crib seed and watch the growth and weigh the result.

Nature carefully wraps the ear in a shuck that is so arranged as to batten cracks, and in the natural state this shuck twists into a pigtail and remains tight to the ear. This affords a perfect protection from weather. Note also that the grain is bedded, germ first, into the chaff-covered cob. There is arranged a little slip of velvet extending up between the grains about as high as the germ. All this delicate arrangement surely has a design. It means something, and the most sensible answer is, protection from sudden changes of temperature and moisture.

I once visited a seedsman in winter and in walking through his corn crib I asked him why he had no fire. He said that he builds a fire when the weather turns muggy and corn is absorbing moisture to keep the corn dry, instead of building a fire when it is cold to keep the corn warm.

Allow me to emphasize the fact that we can not violate with impunity any of these well defined principles of nature without suffering for our indiscretion. Some shuck seed and dry it and then bury it in an oats bin so that the oats furnish the broken wall that protects from sudden changes of temperature and moisture. This is far safer than to leave it exposed, but it does not yet satisfy those best conditions of absolute freedom from excess of moisture, and sudden changes of temperature.

The ideal seed corn is grown in a fertile plot to itself, from pedigree seed, with extra care, and then never allowed to know that winter has passed.

The second reckless treatment of the corn plant is in planting. It is often planted deep to secure depth of roots below the surface. The corn plant is a grass, and comes to the top like wheat, abandoning the first roots. The only way to get the root system down a few inches to give room to cultivate, is to plant in a furrow. It will then make its crown below the bottom of the furrow, and will never change again. Many plant

in a furrow avowedly for this purpose, but then harrow the furrow full of dirt before the corn comes up. This violates all the principles we have been favoring, as the germ must now come through too much dirt, and will set its crown just below the surface. To get the roots down we must let the plant come up in the furrow and make its crown and then we may feed dirt around it as much as it will bear and it will not again change its root system.

A third mistake in growing corn depends on soil and seed bed. It often occurs, however. It is in plowing deep the first cultivation. If soil is reasonably well held up with a three years' rotation with clover, the seed bed, if not worked too wet, is not too firm if left firmed down. We often see our corn make little growth for a week or two after the first plowing and say that it is simply rooting well. But if we could leave the seed bed firm it would grow right along. It is waiting for the seed bed to get firmed down. Nature's seed bed is much firmer. Besides, corn three or four blades high has longer roots than most men think, and these are broken and disturbed in this deep plowing. A field is never fit for corn if it gets so hard that it needs stirring deep after corn is planted.

A fourth mistake is in "laying by." This depends much upon dryness of the season and on the corn not being blown down. It often happens that after corn is "laid by" there comes a puddling rain, and forms a firm crust. Now if one can get through, it pays big to go through with a "Planet, Jr.," and make a fine mulch again before giving that field up. The corn crop is in a good condition to let alone when there is no crust on top or at least not a firm, deep crust.

This principle may be emphasized in all cultivated crops: "That the work and care of the crop all through, and the cost of tools, will be increased in proportion as the soil deviates from its natural condition, losing humus and fertility; the cost of labor and tools will decrease in proportion as the soil approaches these natural conditions."

FERTILIZERS FOR THE CORN CROP.

W. W. STEVENS, SALEM, IND.

[Prepared by request].

On much of the best farming land in this State no fertilizer is needed for corn, other than the plowing in of an occasional clover crop. In the southern and eastern parts of the State a great deal of commercial manure is used on corn, and it gives most excellent results. From one to two hundred pounds per acre are applied at planting time. This is usually put in with the drill or planter having a fertilizer attachment. Some farmers who use as much as two hundred pounds per acre apply about half the

fertilizer with the seed and the other half is put in with the wheat drill and distributed all over the ground, so available fertility will be within reach of the growing plant at all stages of growth.

Sandy soils do not, as a rule, show much increase of the corn crop where chemical manures are used. The best results are obtained on well drained clay lands, and in a supplemental way with barnyard manure or clover. When we intend to use commercial manures, it is best to apply the barnyard manure thinly on the land, let it go just as far as possible, if we are laboring for the largest possible yield of crop in the aggregate. They give best results thus used together, for the reason that barnyard manure contains an excess of nitrogen and is deficient in available phosphoric acid. This latter element we usually have in greatest quantity in the chemical manure.

In order to maintain the fertility of the soil and secure satisfactory returns from the corn crop, we should always aim to have a clover sod to turn, and then use a fertilizer containing such proportions of the fertilizing elements known as phosphoric acid, ammonia and potash as will give best results. If the clover is turned down we are not likely to need any ammonia. We get this element from the clover, and it is the cheapest and best source for same. On most clay lands there is naturally an abundance of potash, and when this element is applied the beneficial results will be seen on the clover that follows rather than on the corn to which it is applied. So phosphoric acid is the principal fertilizer element we need for the corn crop.

Very few of us use as much clover as we ought to, hence the necessity for having a fertilizer containing a fairly good per cent. of ammonia, say $2\frac{1}{2}$ or 3 per cent. Most farmers buy and use ready mixed fertilizers containing all three of the above elements, say in about the proportion of 10 per cent. of available phosphoric acid, 3 per cent. of ammonia and 2 per cent. of potash, and we may add that in many instances a good large per cent. of the money thus invested in fertilizer is badly invested and does not bring in profitable returns. A complete fertilizer is needed on some lands, but on most lands one or two of the above elements is all that is needed.

To use a fertilizer economically, you must use it intelligently—that is, first know what element of fertility is deficient in your soil, and then supply it from the cheapest source. If you want phosphoric acid, its cheapest source at present is that which comes to us from the phosphate rocks in the southern States, known as acid phosphate. The ammonia supply comes to us in most liberal supply from tankage or slaughter-house refuse. The potash all comes from the mines in Germany. Where cotton-seed meal or castor pomace can be gotten cheaply, they furnish ammonia cheaply, but must not be mixed with the phosphate till we are ready to apply the fertilizer to the soil.

The intelligent user of fertilizers, in any considerable quantity, does

his own mixing, and thus saves several dollars per ton in the price of his fertilizer, gets just what he wants and knows just what he is using.

In car lots and in bulk, acid phosphate can be laid down in most any part of this State for \$12 per ton, a phosphate containing at least 16 per cent. of available material. The tankage varies in price, according to the demand, ranging from \$16 to \$18 per ton. On our clay lands we do not use potash, for the reason that carefully conducted experiments do not show profitable returns when it has been used. For a corn fertilizer we use to the ton about 1,200 pounds of acid phosphate and 800 pounds of tankage or cottonseed meal. We have tried other proportions, but this seems to give best results. With 200 pounds per acre, we have had this kind of fertilizer to more than double our yield of corn. And the good results of the fertilizer application do not end with the corn, for it does not appropriate it all, as succeeding crops will show.

Farmers need to co-operate in buying fertilizers, as in car lots they can always secure regular wholesale rates.

ELECTION OF OFFICERS.

Permanent organization was effected by the election of A. O. Lockridge, Greencastle, President; James Rily, Vice-President; H. F. McMahan, Secretary and Treasurer.

In accepting the presidency of the Association, Mr. Lockridge, among other things, said:

"You have reposed in me a trust that I shall use my best efforts to bring to high fulfillment. I recognize the imperative need of active work that the first year of the Association may be an entire success. I would suggest that frequent literary meetings be held, and at some time during the year there be held an exhibit of corn and its products. No subject is of so much importance as corn growing to the farmers of the middle West, nor is there any other so full of interest."

LIST OF MEMBERS WHO WERE ACTIVE IN THE FORMATION OF THIS ASSOCIATION.

It will be a matter of interest to future members of the Association to know who inaugurated the movement; therefore the names and addresses are appended:

Prof. C. S. Plumb, Lafayette; Prof. W. C. Latta, Lafayette; E. B. Martindale, Indianapolis; A. O. Lockridge, Greencastle; H. C. Hedges, Whitaker; D. J. Cloud, Thorntown; George Walker, Willow Branch; Wm. Schillmeier, Gem; E. A. Robinson, Rocklane; J. E. Wile, Thorntown; P. K. Hessong, Zionsville; T. P. Hessong, Nora; Robert Ridgeway, Amboy;

Jacob Orth, Edwards; J. C. Rynerson, Clayton; Edward Roberts, Pendleton; A. W. Tindall, Wilson; J. M. T. Welborn, Bridgeport; J. R. Hall, Indianapolis; C. S. Mace, Blocher; J. D. Whitesides, Franklin; Worth Osborne, Winchester; W. W. Stevens, Salem; B. F. Snyder, Liberty; Frank P. Johnson, Howlands; E. H. Collins, Carmel; O. P. Lafuze, Liberty; J. A. Guilliams, Fincastle; W. H. Burris, Deacon; Granville H. Hull, Lafayette; Chas. Buckley, Delphi; Ben F. Billiter, Huntington; R. C. Morgan, Knightstown; M. C. Ensminger, Danville; A. M. Owen, Raccoon; W. H. Shields, Rockford; P. K. Bushkirk, Bloomington; J. W. Apple, Oaklandon; Daniel Miller, Mansfield; L. B. Clore, Franklin; I. Newt Brown, Franklin; Alpha Chrisney, Chrisney; H. F. McMahan, Fairfield; James Rily, Thorn-town; W. A. Hart, Portland; J. H. Gwaltney, Poseyville; T. F. Yundt, Franklin; Chas. Brown, Franklin; J. G. Kingsbury, Indianapolis; S. H. Lamb, Amboy, Ind.

ANNUAL MEETING
OF THE
Indiana Association of Veterinary Graduates,

HELD AT
INDIANAPOLIS, IND., JANUARY 3, 1900.

The annual meeting of the Indiana Association of Veterinary Graduates convened in the State House January 3, 1900. President J. W. Klotz was in the Chair, and the following veterinarians were present: J. W. Klotz, F. A. Bolser, O. L. Boor, J. E. Cloud, C. P. Wilson, G. H. Roberts, J. Crail, Geo. G. Ferling, Robert Harper, J. M. Pattison, J. C. Rogers, L. A. Greiner, J. P. Heaton, I. D. Reynerson, F. W. Brewer, S. M. Springer, James Brashaw, J. M. Greiner, Ferd A. Mueller, A. W. Bitting and visiting veterinarians from the Bureau of Animal Industry, N. C. Sorensen, Tait Butler, R. W. Tuck and S. G. Hudson.

After transacting the routine business, Dr. G. H. Roberts presented the following report upon ten cases of Parturient paresis treated by the Schmidt method:

REPORT OF TEN CASES OF PARTURIENT PARESIS TREATED
BY POTASSIUM IODIDE.

G. H. ROBERTS.

Gentlemen—I shall not discuss the nomenclature, etiology or pathology of this disease, as that has been done so frequently in veterinary literature. Schmidt's theory is probably the latest and assumes that the disease is produced by an auto-intoxication due to an absorption of toxic substances produced in the udder. Upon this assumption Schmidt proposed a treatment consisting of an injection of an aqueous solution of iodide of potassium in the udder, which would combine with the toxins and render them inert. Whether his theory be correct or not, the results of the treatment as reported have been very favorable. My cases are tabulated as follows:

REPORTS OF TEN CASES OF PARTURIENT PARESIS TREATED WITH POTASSIUM IODIDE.

No. of Case.	Breed of Cow.	Time of Tak- ing Ill After Delivery.	Time of Treat- ment.	How Much Potassium Iodide.	Time of Re- covery After Infection.	Time of Death.	Complications and Remarks.
1	Shorthorn.	20 to 24 hours.	24 hours.	dr. iiss.	Died next day.	Next day.	Down flat, very fat and in a very bad stable. Up and eating a very little, but was very weak, showed lung complications from which she died six days later. This cow had been drenched with one-half pound of sulphate of magnesia in 20 ounces water, and I think this the cause of the complication.
2	Jersey, 4th calf.	About 24 hours.	8 or 10 hours.	dr. iiss.	48 hours.	6 days later.	This cow made a nice recovery, was out eating grass next day, but there was slight mammitis which soon disappeared without any special treatment.
3	Jersey Grade, 3d calf.	14 hours.	Very soon.	dr. iiss.	11 hours.	.....	In this case I dissolved the iodide in a quart of water fresh from the well, without boiling; there was no mammitis following.
4	Shorthorn Grade.	Next day.	5 hours.	dr. iiss.	■ hours up.	.....	Two pounds of sulphate of magnesia and a pint of warm lard had been given before I saw the case. She had a retained placenta, which I re- moved. I saw the cow a week later, the owner was milking her, but she looked thin. During the following week she was seen to run after a boy passing through the field, but dropped dead before reaching him.
5	Jersey Grade.	.....	36 hours after taken.	No iodide used.	Up next day and eating.	.....	She was lying flat on the ground, cold to the head. A slight mammitis followed, but yielded with the assistance of very slight treatment.
6	Native.	15-20 hours.	Soon after.	dr. iiss.	9 hours.	.....	This cow was not very bad and no other treat- ment was used. She was quite well the next morning.
7	Jersey.	24 hours.	A few hours.	dra. ii.	.....	.....
8	Shorthorn, 4th calf.	Before delivery.	5 or 6 hours after taken.	dra. iii.	.....	48 hours.	This, as well as all the above cases, except No. 7, were given in connection with the Iodide of P. B. nux vomica, dra. i. P. B. digitalis, dra. 1/2, every 4 hours without diluting, also 1 dram of nitroglycerine, 1 per cent, every hour.
9	Jersey.	12 hours.	3 hours.	dra. iiss.	12 hours.	.....
10	Jersey, 4th calf.	Did not get up after delivery.	14 hours.	dra. iiss.	11-12 hours.	.....

I draw the urine, keep the animal, if possible, lying on the sternum, and look after the patient's general comfort.

The technique is to dissolve from one and one-half to two drachms of iodide of potassium in a quart of sterile water. Draw all the milk from the udder, wash the udder and teats with a carbolic acid solution and introduce the iodide of potassium solution into the udder by means of a funnel rubber tube and milking tube—getting about equal quantities in each gland. The gland is then well kneaded to get the solution diffused throughout the tissues as much as possible.

The paper was generally discussed and all except Dr. Rogers agreed that they had better results with this treatment than by the older methods, but that the results were not as good as many writers claimed.

Dr. Bitting said that he had found a dairyman who had been in the business for a number of years and had used bicarbonate of soda in the same manner. He put a tablespoonful in from a quart to three quarts of water. He claimed good results as far as recovery from the attack was concerned, but lost a large percentage of udders from mammitis. He did not use antiseptic precautions and did not know of the advantage of boiled water. His idea was to start the flow of milk. He had never heard of the iodide treatment.

Dr. Greiner then read a paper upon "Fistulae."

Dr. Brewer read a paper upon "Pneumonia."

Dr. Bitting exhibited to the society two fine pathological specimens contributed by Dr. J. O. Greeson, of Kokomo. The first was a mucous cast about three feet in length from the ileum and four inches of the caecum. The cast was passed by a calf four months old suffering from catarrhal enteritis. The second was a mucous cast from a steer affected with balanitis. The veterinarians were urged to save their valuable specimens for exhibition at the annual meeting. At the meeting of the State Medical Society and of the American Medical Association in 1899 he contributed about 300 specimens of tissues and photographs in the department of comparative pathology.

The following is the list of graduate veterinarians in the State, as far as known:

Armour, W. J., Goshen.
Ainsworth, C., Greensburg.
Anderman, F. W., Hartford City.
Armstrong, T. L., Indianapolis.
Bitting, A. W., Lafayette.
Baker, A. W., Fowler.
Bell, C. F., Kokomo.
Bolser, F. A., New Castle.
Boor, O. L., Muncie.
Bothkin, F. L., Muncie.
Buckner, G. W., Bluffton.
Buzzard, David, Goshen.
Chamberlaine, R. L., Waterloo.

Cramer, J., Elwood.
Clevenger, W. C., Winchester.
Cloud, J. E., Indianapolis.
Connor, W. W., Pendleton.
Coppes, G., Ligonier.
Cox, A. G., Carlisle.
Craig, W. B., Indianapolis.
Craig, R. A., Lafayette.
Crail, J., Shelbyville.
Creedon, Joseph A., Indianapolis.
Culbert, J., Portland.
Cell, Henri, Wabash.
Dryden, W. A., Columbus.

Elliott, C. V., Terre Haute.	Myers, F. W., Ft. Wayne.
Elliott, John, Indianapolis.	Osborn, Frank, Petersburg.
Ferling, G. G., Richmond.	O'Leary, G. M., Huntington.
Fisher, G. E., Kendallville.	O'Rear, P., Indianapolis.
Fitch, Schuyler, Hometown.	Pattison, J. M., Connersville.
Gadde, Thos., Indianapolis.	Paxton, —, Laporte.
Fitch, David, Auburn.	Peed, Jas. A., New Castle.
Flemming, C. I., Indianapolis.	Pote, T. B., Terre Haute.
Galbraith, A. D., Greensburg.	Pritchard & Son, Indianapolis.
Gosnell, C. W., Lebanon.	Rager, Charles, Silver Lake.
Gauze, Clark, Carthage.	Ramsey, S. V., Terre Haute.
Greeson, J. O., Kokomo.	Ramsey, Wilfred, Middletown.
Greiner, L. A., Indianapolis.	Reed, J. W., Elwood.
Grouse, Charles, Carthage.	Roberts, G. H., Indianapolis.
Gillespie, —, Waveland.	Rodger, J. C., Anderson.
Hanssen, J., Monon.	Rodebaugh, Samuel, Augusta.
Hall, R. J., Rushville.	Roe, J. T., New Augusta.
Harding, R. A., Logansport.	Sangster, —, Monticello.
Harper, Robert F., Indianapolis.	Stull, C. M., South Bend.
Hass, C. S., Bristol.	Springer, Samuel, Irvington.
Heaton, J. B., Bloomfield.	Sayer, D. B., Wabash.
Heighway, J. G., Ladoga.	Schwin, P., Elkhart.
Hoover, Lee, Richmond.	Simon, G. L., Marion.
Hammond, Isaac J.	Smith, Butler, Greensburg.
Justice, H., Delphi.	Smithers, E. P., Vincennes.
Kenner, H., Cambridge City.	Smock, Harry E., Franklin.
Kine, C. P., Columbia City.	Stauffer, B. E., North Manchester.
Kannal, H. J., Rensselaer.	Sturn, J. D., Dana.
Klotz, J. W., Noblesville.	Tait, —, Greencastle.
Kintner, J. B., Danville.	Thompson, A. J., Terre Haute.
LaFever, J. W., Warsaw.	Thompson, A. R., Attica.
Langtry, Walter, Ft. Wayne.	Upshall, John, Peru.
Laidlaw, J. E., Bluffton.	Wallace, W. B., Marion.
Mabie, Wm., Warsaw.	Ward, H. H., Rochester.
Mahorney, J. H., Liberty.	Watson, J. W., Peru.
Matthews, A. D., Lafayette.	Wilkins, E., Alexandria.
Martin, C. F., Evansville.	Wilson, Claud P., Greenfield.
McGlassony, A. H., Madison.	Whitestine, O. G., Huntington.
Mitchell, J. R., Evansville.	Wylee, M. C., New Harmony.
Matthews, —, Anderson.	Wilson, Perry, Delphi.
Mueller, Ferd. A., Indianapolis.	

The following were elected as officers for the year 1900: J. W. Klotz, President; George G. Ferling, Vice-President; G. H. Roberts, Secretary; and O. L. Boor, Treasurer.

PNEUMONITIS.

F. W. BREWER.

Pneumonia cruposa is commonly called lobar pneumonia, from the fact that it generally affects the whole or a portion of one lobe. It is not necessarily confined to one lobe, as it may affect the whole lung or a part of both. When both lungs are affected it is called double pneumonia.

It is an acute, infectious, inflammatory disease of the lungs, characterized by high fever, running a definite course and terminating in from six to fourteen days by crisis. It attacks by preference the lower lobes of the right side, probably on account of the right bronchi coming off at a more acute angle and thus favoring respiratory stasis. A bacteria especially prone to occur in pairs and known as the diplococcus, or micrococcus pneumoniae, is now regarded as the cause. This germ is found in nearly every case, and when not found it is supposed to be due to some blunder of the pathologist. The diplococcus was discovered by Fraenkel in 1886. It occurs in pairs or sometimes in rows or beads.

The diplococcus is non-motile and anerobic. They cause the disease by rapidly multiplying and casting off a toxic substance which has been called pneumotoxin. They gain entrance through the respiratory system. During the later stages the staphylococcus, pyogenes aureus and albus are found in great numbers. They are regarded as non-pathogenic organisms, but may exert, as is believed by many, a beneficial action in the liquefying process of the exudate, as they belong to the group of liquefactive bacteria.

But we must not forget certain predisposing causes, as cold, exposure to wet and sudden changes of temperature, shedding of the coat, all of which may so weaken the system as to render it impossible for it to withstand the invasion of the pathogenic bacteria.

The disease has been repeatedly reproduced by inoculation of the smaller animals with the germs obtained from a culture medium, thus leaving no doubt of its infective nature.

Of the pathologic changes I will speak very briefly, as they are well known and always run the same course unless death intervenes. There are three distinct stages.

First. Congestion or engorgement.

Second. Red hepatization or splenization.

Third. Gray hepatization.

In the first stage the lung is engorged with blood, but is as yet permeable to air. The capillaries surrounding the air vesicles are turgid and intrude upon the termina of the air cells.

There is a small amount of transudate in which may be found a few exfoliated epithelial cells and red blood discs. In this stage the diplococci are found most abundantly.

On section the part of the lung invaded is found very red and heavier than normal, but will float if placed in water. Frothy blood oozes from the cut vessels and bathes the surface.

In the stage of red hepatization the lung is dark red in color, indurated and very much heavier, its weight increased as much as four or five times, and will rapidly sink if placed in water.

The lung pits are pressed, consequently the marks of the ribs are seen after removal from the body.

On section the aptness of the name is quite apparent, the surface having the appearance of liver. On passing the finger over the surface, innumerable little hard spots like grains of sand are found. These are the air vesicles filled with the exudate. Corresponding to this a granular appearance is recognized by the eye, the distended alveoli appearing as glistening points. This exudate may extend into the infundibula or even into the smaller bronchioles.

The lung, though quite hard, is friable and may be broken up into small pieces with the fingers.

Microscopically the alveoli are found to contain a delicate reticulum, the meshes of which are filled with red blood and alveolar epithelial cells in various stages of degeneration. Also a goodly number of phagocytes and lymphoid cells. In this stage the diplococcus are not so numerous. But we find the streptococcus, pyogenes cerves and albus making their appearance.

The third stage, or that of gray hepatization, is also well named, the cut lung exhibiting a grayish white appearance. It is still dense and heavy, but more moist and even more friable than before. The granulations are less distinct and on microscopical examination we find the alveoli filled with white blood cells, the red blood corpuscles and fibrin filament having disappeared; also the pneumococcus have almost entirely disappeared, but the staphylococcus are found innumerable.

The pleura over the inflamed area is almost always involved, the most distinctive sign of this being a plastic deposit or perhaps a serous exudate. After death the left cavities of the heart are nearly always found empty, while the right is often filled with a firm coagula which often extends into the pulmonary artery. The spleen is enlarged and the cells lining the auriferous tabules often in a state of cloudy swelling.

TERMINATIONS.

When pneumonia terminates favorably and promptly after the crisis it is said to terminate in resolution, by which is meant that the inflammatory products liquefy and are absorbed and the lung returns to its normal physical appearance and physiological functions. Resolution may, however, be delayed, or may not take place at all. In such event the more unfavorable terminations, as of gangrene or formation of abscesses, or development of chronic interstitial or fibroid pneumonia, may take place; but this last is rare in the horse.

SYMPTOMS.

The disease is ushered in with a well marked rigor, not always noticed, on account of the attendant being absent at the time. This is followed by a high fever, often running as high as 107 to 108 degrees Fahrenheit, but I have never seen it higher than 108. On inspection we find the patient standing, base wide, elbows turned outward. There is a peculiarly anxious expression, eyes abnormally bright, alae nasi distended and flapping, often a rusty colored discharge from the nostril, due to stagnating of the epithelium or some of the bronchioles. Constipation, anoraxia, and thirst are present; urine highly colored and scanty; mucous membranes yellowish in a great many cases, due to absorption of bile and toxic matter from the alimentary canal; respiration greatly increased, 300 and 400 per minute; pulse at first full and strong, but soon becomes weak, depressed and very fast; leucocytosis well marked and the blood has a slight acid reaction; extremities cold, or alternating hot and cold; on percussion in the first stage normal resonance slightly dulled; in the second stage marked dullness is complete over solidified area; in the third stage normal resonance returns as the solidified products are absorbed; on auscultation the vesicular murmur is greatly increased during the first stage, the lung still struggling to perform its functions. In the second stage we get no sound over the portion involved, except perhaps a slight tubular rale. But around the solidified zone we get a heightened murmur. In the third stage dullness is still well marked over the center of the solidification, but around the edges the crepitate rale is heard, if resolution is taking place, showing that the lung is returning to its normal condition.

DIAGNOSIS NECESSARILY GRAVE.

If only a part of one lung is affected and there are no untoward complications, we may expect a favorable termination. If the fever is subsiding and there is a general remission of symptoms, we will prognosticate a speedy recovery. But, on the other hand, if the temperature begins to fluctuate and all symptoms appear aggravated, with a steady loss of strength, we may expect fatal ending soon.

A horse dying with pneumonia is indeed a pitiful sight. He makes a few frantic efforts to keep his feet, staggers, and falls to rise no more; a few convulsive gasps and his life is ended.

TREATMENT.

First of all, good hygienic surroundings, preferably a box stall; good ventilation, no draught, but ventilation at all hazards. Food of the most nutritious character, diversified and in small quantities at regular intervals, especially during convalescence, for better a few days' fasting at the beginning than a cloyed appetite. Clothe according to season, warmly in winter, with blankets and bandages for the legs. A light sheet should be

used in summer to protect him from the flies. Sponging with hot water in winter and cold in summer, to increase the physiologic functions of the skin; heat radiation and elimination of waste product, plenty of pure, fresh drinking water should be kept before the patient at all times. Enemas of warm or cold water, once or twice daily. Medicinally, sedatives or stimulants, as the case may require. Internal antiseptics and febrifuges are indicated, but I would be very careful giving diuretics, rather seeking to remove the toxic materials by some other channels than the kidney, as they are quite apt to be overworked already. Especially would I recommend calomel in broken doses, twelve or fifteen grains, combined with two or three drams of bicarbonate of sodium every four hours, for thirty-six to forty-eight hours; then followed by sulphate of sodium from four to six ounces. This routine to be kept up during the course of the disease, or until the bowels move freely.

At first a sedative, aconite in twelve to fifteen drop doses three times daily, or acetanilid in one or two drachm doses three or four times daily, which has the advantage of being an antiseptic also, but is rather more depressing than aconite, I believe.

But these must not be carried too far. Just where sedative treatment should cease and stimulative begin is a question that is sometimes difficult to solve. I prefer to be governed by the heart sounds rather than the pulse. So long as the first sound is full and strong and longer than the second, I feel safe with sedatives; but when the sounds become equal or nearly so, then I begin stimulative treatment. Fluid extract of digitalis, one-half drachm, or fluid extract of nux vomica, one-half drachm, belladonna, one to two drachms, or these may be given in combination. Also ammonium chloride as stimulant to the bronchial mucous membrane. Internal antiseptics, salol or salicylate of sodium in doses from one to two drachms, or the old stand-by, quinine sulphate, one or two drachms, three times daily.

As an after treatment arsenic two to four grains twice daily, or iodide of potassium one-half to one drachm with nux vomica. At first sedative and stimulative treatment may be used alternately, but must be very carefully guarded. There is also an antitoxin prepared which is recommended very highly, but of this I can not speak from experience.

FISTULA.

L. A. GREINER, V.S.

There are few questions in the whole field of veterinary science of which the young practitioner feels that he knows more, and the older one wishes he did know more.

Aside from castration, there is probably no one class of patients with which rural practitioners deal more commonly, and none are more disagreeable or more unsatisfactory. We discuss them at annual meetings, State association meetings, and, in fact, we discuss them all the time, and yet we use about the same old treatment as did our predecessors half a century ago. They are just as disagreeable, just as dirty, just as slow and just as liable to recur. A thorough discussion of the anatomy concerned in the question of fistula of the cervical and anterior dorsal regions calls for a study of thirty-two pairs of muscles, nineteen pairs of nerves, one ligament and twenty pairs of arteries and their associated veins.

An operator who cares to become an expert in the treatment of these cases must know where those muscles are, their origin, insertion, direction of fibres and their functions; he must have definite ideas of the location, course and distribution of the larger blood-vessels and nerves if he would make very deep incisions and punctures, as he sometimes must do. It is very unpleasant to cut the dorsal, superior cervical or even larger branches of the vertebral, under several inches of muscular tissue.

ETIOLOGY.

The next question is that of cause, and, like Darwin's first drop of protoplasm, some points are not easily explained.

In discussing this subject under the four topics, origin, mode of entrance, and factors which determine the location of the prefistular abscess, I wish to make, incidentally, the following points: That suppuration rarely or never occurs without the presence of pyogenic microbes or their products; that the initial abscess is usually the result of a local autoinfection; that fistula may be indirectly transmissible, due to any one or to a combination of several pyogenic microbes, and, therefore, not specific; that one attack gives no immunity, but on the contrary is a predisposition to others; that external injuries may serve to fix their location, but are not to be regarded as primary causes.

In the early days of antisepsis, when healing without pus was first demonstrated to be possible, we received the old dictum, "No micro-organism, no pus." Since those days this question has been argued back and forth by Ogston, Fehleisen, Zuckerman, Nathan Watson, Cheyne and DeBary, who uphold it, and Grawitz, Counsilman, Uskoff, Rosenbach, Orthman and Janowski, who oppose it. Dr. Senn, in his surgical bacteriology, concludes that pus microbes are the essential cause of suppuration; while Fraenkel, in his text-book on bacteriology, concludes that the weight of evidence is on the other side. Some admit that suppuration may occur or occasionally be produced by deep injections of germ-free irritants, like nitrate of silver, ammonia, turpentine, or cadaverine; but I think the great majority of competent observers hold that the great and common cause is the presence and activity of pyogenic micro-organisms in susceptible

tissues, and that certain of these organisms may be regarded as specific exciters of suppurative tissue changes.

Ogston, as early as 1881, patiently examined the contents of sixty-nine abscesses for micro-organisms and found streptococci in seventeen, staphylococci in thirty-one and both in sixteen. He also noted that the former followed the lymphatic channels and produced diffuse and extensive suppurations, while the staphylococci produced and appeared more commonly in distinct abscesses.

Rosenback carried his work farther, with better facilities, classifying and naming pyogenic microbes and adding to the list. Zuckerman tabulated 495 abscesses, showing that 71 per cent. contained staphylococcus, 16 per cent. contained streptococcus, both were found in 5.5 per cent., and the other pyogenic microbes rarely.

Tricomi, in 1888, reported an examination of eighty abscesses, five phlegmonous inflammations and five furuncles, and found in all one or several of the recognized pyogenic microbes. A vast amount of statistics have been published which prove beyond question that under natural conditions certain micro-organisms are always associated with the origin of pus. And it is equally plain from every-day observation that bruises or external irritants of any kind do not alone produce abscesses. It is true that Fehleisen, Grawitz, Scheuerlin and other investigators have produced a limited suppuration by injections of ptomaines; but this is no argument against a theory of bacterial origin.

Finally, fistula frequently appears in an endemic form. I myself have had five cases on the same pasture that developed rapidly and in close succession. In every case there was present decided elevation of temperature, loss of appetite, thirst and rapid loss of flesh.

INFECTION—SOURCES.

It is not difficult to enumerate sources from which infection may be received, but it is frequently impossible to prove a specific origin in an individual case. Pyogenic bacteria have a wide diffusion in nature, for they have been demonstrated in air, soil, water and a variety of foods. There is the old question of hereditary transmission with the still unsettled points—transmitted tissue susceptibility, or transmitted living germs—and the latter seems to be gaining ground with plenty of clinical evidence in its favor. Lebedeff reports a case where he found streptococci in various tissues of a child prematurely born of a mother who recently had erysipelas. Sangalli reported the finding of bacillus anthracis in the blood of a foetus whose mother had died of carbuncle. Ahlfeld and Marchand, together, reported two autopsies, which showed that a child had died four days after birth from anthrax, and the mother died eight hours after delivery from the same cause. Netter, Bollinger, Straus, Koubassoff and Livy have cases similar to pathogenic germs acquired in utero. Dr. John, in 1890, published a calf case more interesting to the

veterinary profession than all the others to date. In this case an eight-months' foetus was taken from the body of a tubercular cow. The foetal lungs and liver both contained tubercles and bacilli of tuberculosis; and Livy reports a case wherein the pneumonia diplococcus of Fraenkel and Weichselbaum played a singular part. In view of all this evidence, we can hardly doubt the possibility of actual germ inheritance, and especially since Nepveu has shown, in two cases, that pyogenic organism may remain dormant or encisted for years, awaiting favorable conditions for development, and then cause profound dissimilar cases, which clearly proves that apparent pathological conditions do not necessarily follow immediately the introduction of those microbes, and which prove, also, that the absence of such conditions does not demonstrate an absence of pyogenic organism.

To sum up this discussion of source we can easily say that these troublesome micro-organisms are derived from the soil, air, food and maternal circulation.

MODES OF ENTRANCE.

The actual transmission of living micro-organisms from mother to foetus "in utero" is possible and probably frequent has been fairly established by competent observers, whose notes and opinions have already been given. Fraenkel, in explaining the sources of errors which interfere with inoculation experiments, says: "There are three ways in which micro-organisms usually penetrate into our bodies: First, from the surface of the skin, generally after it has been injured in some way; it does not, however, always require such a special door of entry. Second, the digestive canal into which the bacteria pass along with the food. Many, it is true, can not pass through the stomach in their usual form, being destroyed by the action of its acid contents. Other kinds are less sensitive and when spores are present, or when disease has altered the character of the digestive fluid and weakened its bacteria-killing power, there is no further obstacle to the passage of the parasites. Third, the respiratory organs can afford entrance to the bacteria."

Zuckerman, in summing up his experiments on suppuration, says plainly that pus-microbes can enter the body through the skin, intestinal mucous membrane or by way of the respiratory organs, but the most frequent entrance is through the skin; and Dr. Longard, in discussing certain superficial abscesses, declares as his opinion that they are caused by pus microbes which gained access through the sweat glands, and gives his reason for the latter proposition that these certain microbes were found in abundance on the inner surface of the membrane propria of these glands, where they remained harmless till they penetrated to the underlying connective tissue. Anyway, may not this be correct? This continuous lumen of the coiled tube, which constitutes a sweat gland, and the sudoriferous canal, which connects the gland with the body surface,

is covered internally with a very thin, delicate membrane. This membrane is covered by two or three layers of polyhedral, epithelial cells, and over these lies the membrana propria. Why may they not reach the underlying connective tissue of the corium, or even the subcutaneous tissues? Each gland has an afferent arteriole from which is formed a delicate plexus of capillaries, surrounding the gland tube. Thus are furnished the necessary conditions for receiving and distributing these pyogenic organisms.

LOCATING FACTORS.

After discussing the bacterial origin, sources from which infection may be drawn and mode of entrance, there remains the query, what determines the location of the pre-fistular abscesses? It has long been a matter of dispute whether pathogenic microbes exist in healthy animal tissues. I think the view is gaining general support that such conditions are possible, but that these same microbes do not exhibit their pathogenic properties so long as they remain in circulating blood and every body tissue remains healthy. Then to furnish the requisite conditions under which these pyogenic microbes may exhibit their pathogenic functions, some susceptible tissue must become injured or diseased, the blood or lymphatic fluid must be checked in its flow at that point, thromboses be formed, and the microbe be permitted to locate and multiply. In other words, to locate pre-fistular abscess there must be furnished a locus minoris resistentiae, which Dr. Senn defines as being an area of lessened resistance due to a tissue injury, which so changes the tissue that pathogenic microbes previously present in the circulation become arrested, and find favorable conditions for multiplication. Dr. Huber asserts that several infectious diseases, as tubercular ostitis and arthritis, osteomyelitis and pyemia may follow trauma in the absence of any possible local external infection. His experiments on rabbits with anthrax bacilli are well worthy of study. He produced an inflammation of one ear by applying croton oil, leaving the other untouched. He then injected a pure culture of bacillus anthracis, and compared results on the two ears. His conclusions are that "the bacillus of anthrax finds in a soil prepared by an inflammation induced by croton oil a locus minoris resistentiae, which presents more favorable conditions for its growth than tissues in the other parts of the body. His conclusions may be summarized as follows: Localization of pre-existing micro-organisms in tissues prepared by injury or disease takes place, provided that the necessary conditions for their growth are present."

But recent tissue lesions are not the only factors which may serve to produce such an area of lessened tissue resistance. The presence of old pathological products, exposure, feeble performance of any organic function, and a variety of general and illy-defined factors seem to produce conditions favorable to local infection. The regions which fistulae usually

select are such as are liable to receive blows and bruises, given by angry attendants, received in passing under low sheds and through low doors, or while rolling. Again, the soft tissues of these parts are mainly connective, and connective tissue areas are very prone to chronic suppurative process and slow healing. Such then are the factors which serve to locate suppurative processes.

There yet remain many questions regarding the history and work of pyogenic microbes for bacteriologists and chemists to answer. We all wish to know to what depth beyond the surface of a pyogenic membrane do these pus-producing germs reach, and why does pus burrow? Is it by pressure and absorption? Is it due to a peptonizing activity of bacterial waste products, or is it due to some mysterious part played by the pyogenic microbes in their effect upon protoplasmic cell contents? We do not know so much as we would wish regarding the metastatic tendency of suppurative processes. Fistulae sometimes heal rapidly and abscesses develop in the atlo-axoid region. There are some strange features in such cases. Why do not domestic animals other than solipeds commonly develop fistula? Is it a question of tissue resistance, anatomical peculiarity, or a difference in histological elements?

The chemist might give us a non-toxic, diffusible antiseptic that will pass through the circulation and be excreted unchanged and capable all the while of destroying pathogenic microbes. There is a mysterious part played by certain portions of the lymphatic system that we could wish made plain. We do not even feel certain that we know why fistulae occur more frequently in the superior cervical than in the gluteal or dorsal regions.

TREATMENT.

Many annoying features appear in the treatment of these cases which may be well understood and yet difficult to handle. For example, the well known tendency to recur after indefinite periods of apparent soundness.

Internal treatment, consisting of alteratives and tonics, may sometimes be used with advantage. Generous food and tonics are always in order if patient is unthrifty.

The conditions which experience has taught me are necessary to successful treatment of fistula are briefly:

1. Free escape of pus to carry out microbes and ptomaines.
2. Destruction of the pyogenic membrane lining, old sinuses and cavities.
3. Destruction of accessible pyogenic microbes.
4. Removal of foreign substances, as splinters of wood or necrosed bone.
5. Establishment of an active granulating process.

The first I try to obtain at any cost. I accomplish such drainage by the

knife, or trocar and canula. I have never tried to trephine the scapula, but believe it can be done with advantage in those cases where a sinus runs down into the sub-scapular region; at least, I shall certainly try the operation when the first favorable case presents itself.

In a few cases bottom drainage seems impossible. The only satisfactory substitute with me has been hydrogen peroxide.

The next condition is secured by digestant solutions, by curet or by not too severe caustics. Diluted nitric acid has given me good results, but my preference is ninety-five per cent. carbolic acid and the sharp interine curet (human). Dilute bichloride, dilute carbolic, and peroxide have proven the most practical antiseptics in most all cases, but I have one to mention which has proven very beneficial in deep sinuses, and that is zinc chloride.

The only way to get rid of foreign substances is by bold surgery. The production of active, healthy granulations sometimes calls for all the ingenuity a surgeon can muster. Turpentine, ammonia, common salt solutions and diluted white liniments have all given good results, but the practitioner must be cautious in using them. Long continued and repeated irrigations with hot diluted antiseptics solution and even hot water, in a steady current, will frequently transform a hopeless old chronic into a very interesting case. In cases where there is intense tumefaction no fluctuation and no sinuses a good stiff blister consisting of biniodide of mercury will be found very beneficial; or I use it in some cases where the discharge nearly ceases but is persistently annoying.

In all my attempts at irrigating deep sinuses I use a long bushy catheter and a continuous flow bulb syringe, with carbolic acid.

Indiana State Live Stock Sanitary Commission.

REPORT OF THE WORK DONE FROM NOVEMBER 1, 1897, TO NOVEMBER 1, 1898.

During the past year the Commission has been very useful to the live stock breeders of our State. Owing to the very wet season, the old pastures became infested with a fungi growth springing up through the sod that was very fatal to cattle, sheep and deer. Some entire herds of young cattle and deer died before word was had from the Commission. Advice was sent to all inquirers telling how to effectually prevent cattle from the poison. Very many cases of toxine poison were reported; also anthrax.

There were a great many cattle shipped into the State and through it, infested with Texas fever. Many cars were prevented from unloading, the Commission requiring them to be shipped to properly quarantined yards. By the timely surveillance and advice of the Commission millions of dollars were saved to the farmers of the State.

The State Veterinarian, accompanied by one or more of the Board of Commissioners, visited the following places hereinafter named, where cases were reported of horses, cattle or sheep being suspected of having symptoms of contagious or infectious diseases. A detailed report of each case is on file in the Secretary's office. The places visited were as follows, viz.:

1897.

November.—

J. L. Fulton, cattle, Vanderburgh County.
Sam Burton, horses, Tippecanoe County.
Carter Burton, horses, Tippecanoe County.
John Sammon, horses, Tippecanoe County.
Thos. Cavatt, horses, Carroll County.
John M. Vorhees, horses, Carroll County.
Peter Stanley, horses, Lake County.

December.—

Wm. Lamb, horses, Tipton County.
Wm. Lamb (again), horses, Tipton County.
B. Hobbs, horses, Tipton County.

1898.

January.—

Jos. Billheimer, horses, Hamilton County.

John Swift, horses, Tipton County.

February.—

Ellsworth Silvers, cattle, Cass County.

Jacob Silvers, cattle, Cass County.

Chas. W. Billings, horses, Carroll County.

Abram L. Spencer, mules, Delaware County.

March.—

Sammon & Critser, horses, Tippecanoe County.

Sammon Bros., horses, Tippecanoe County.

Abram Harrold, horses, Madison County.

Geo. Stackbaum, horses, Pulaski County.

April.—

Stock Yards, Marion County.

Jones Bros., cattle, Clay County.

Stock Yards, cattle, Vigo County.

Frank Hilton, horses, Pulaski County.

Stock Yards, cattle, St. Joseph County.

Stock Yards, cattle, Allen County.

Lawrence Bieger, horses, Tippecanoe County.

Stock Yards, cattle, Jennings County.

W. J. Barnett, cattle, Clark County.

Stock Yards, cattle, Louisville.

Daniel Hammond, horses, Warrick County.

Stock Yards, cattle, Vanderburgh County.

Stock Yards (again), cattle, Vigo County.

May.—

Stock Yards, cattle, Marion County.

Wm. Shute, cattle, Wayne County.

Tony Barrett, cattle, St. Joseph County.

Major Bros., cattle, St. Joseph County.

Stock Yards, sheep, Marion County.

Wm. Beaver, horses, Marion County.

Peter Zimmer, horses, Jasper County.

June.—

A. W. Stevens, mules, Fayette County.

N. F. Bowen, horses, Fayette County.

Geo. H. Bevers, horses, Fayette County.

Geo. H. Bevers (again), horses, Fayette County.

Mahlon Connelly, horses, Fayette County.
 Wm. T. Warsaw, horses, Franklin County.
 Swesky Jones, horses, Franklin County.
 Elijah Matney, horses, Fayette County.
 A. A. Sauerman, horses, Lake County.
 Wm. Slade, horses, Lake County.
 Herman Heind, horses, Lake County.
 A. O. Beckwith, horses, Greene County.

July.—

Wm. Raymond, cattle, Washington County.
 Abe Eickle, cattle, Vanderburgh County.
 Faucette Bros., cattle, Floyd County.
 Thos. Modicutt, cattle, Vigo County.
 Lawrence Beiger, horses, Tippecanoe County.
 M. Levering, cattle, Tippecanoe County.

August.—

E. E. Findley, horses, Washington County.
 Claude Rawston, horses, Washington County.
 H. C. McCoy, horses, Washington County.
 Stock Yards, sheep, Marion County.
 Cassidy Bros., horses, Vigo County.
 M. Kelley, cattle, Knox County.

September.—

Sim F. Lockridge, cattle, Putnam County.
 Walters & Hendricks, cattle, Clinton County.
 Ind. Distilling Co., cattle, Vigo County.
 Wm. Todd, cattle, Posey County.
 Wm. R. McKeen, deer, Vigo County.
 Andrew Jackson, cattle, Carroll County.

October.—

J. F. Williams, cattle, Henry County.
 Alonzo Shaffer, cattle, Marion County.
 Shakes & Unger, cattle, Marshall County.
 Chas. Schlemmer, cattle, Franklin County.

Number of times visits were made to different counties...	74
From November 1, 1897, to November 1, 1898, number of	
horses killed	28
Total cost to the State.....	\$245
Average amount paid per horse.....	\$8.67
The total number of cattle killed from November 1, 1897,	
to November 1, 1898.....	4
Total cost to the State.....	\$40
Average amount per head.....	\$10

Total number killed in different counties:

Washington	2 horses.
Orange	1 horse.
Fayette	6 horses.
Lake	3 horses.
Pulaski	2 horses.
Tippecanoe	6 horses.
Marion	1 horse.
Jasper	2 horses.
Tipton	5 horses.
Vanderburgh	4 cattle.

The expenses of the Commission for the year ending November 1, 1898 were as follows:

For horses killed.....	\$245 00
For cattle killed.....	40 00
For local veterinarians.....	7 00
For Commissioner Geo. W. Hall, expenses and per diem	641 95
For Commissioner M. S. Claypool, expenses and per diem	585 90
For Commissioner V. K. Officer, expenses and per diem	462 70
For State Veterinarian F. A. Bolser, salary and expenses	2,125 55
For Secretary Mortimer Levering, salary and expenses	479 30
<hr/>	
Total paid out by Commission.....	\$4,587 40
Total paid out by State, the appropriation.....	\$4,000 00
<hr/>	
Total paid out by Commission in excess of appropriation	\$587 40

On November 1, 1898, the Commission was composed of the following members:

Commissioner Geo. W. Hall, Raleigh, Rush County, Ind.
 Commissioner M. S. Claypool, Muncie, Delaware County, Ind.
 Commissioner V. K. Officer, Volga, Jefferson County, Ind.
 State Veterinarian Dr. F. A. Bolser, New Castle, Henry County, Ind.
 Secretary Mortimer Levering, Lafayette, Tippecanoe County, Ind.

Very respectfully submitted,

F. A. BOLSER, State Veterinarian.	GEO. W. HALL.
MORTIMER LEVERING, Secretary.	M. S. CLAYPOOL,
	V. K. OFFICER.
	Commissioners.

REPORT OF WORK DONE FROM NOVEMBER 1, 1898, TO
NOVEMBER 1, 1899.

The past year has been one of unusual usefulness and value to the State, in the work performed by the Live Stock Sanitary Commission. Probably never before in the history of the State have the live stock breeders been menaced with such dangerously infectious and contagious diseases threatening the complete annihilation of their horses, cattle and sheep. Owing to the introduction of electric street cars many diseased horses were scattered throughout the State, and the commission was taxed to its utmost capacity to exterminate the cases before they spread their dire infection. Texas cattle and cattle from south of the Ohio River were shipped into various markets, bringing in nearly every case well defined Texas fever. To prevent this and save our native cattle from all being killed by this fatal infection, the commission visited every principal stock yard in the State where such cattle were likely to be unloaded. Stock yards were compelled to build proper quarantine chutes and yards to hold these cattle until either slaughtered or shipped to Chicago. The Department of Animal Industry of the government were very co-operative in this work and supported us in handling all cases as the exigency required.

Sheep scab became again a pest in many flocks, and the commission obliged the owners to properly dip such sheep and also had the stock yards at Indianapolis put in large dipping vats for the dipping of all sheep sold to feeders.

Much attention was paid by the commission to herds of cattle diseased with that great menace to the human family, tuberculosis. Many cattle were found to be affected when the tuberculin test was applied. It is a lamentable fact that the commission has not funds enough to stamp out the tuberculosis existing so manifestly in our dairy herds, as is being done by many other sister States.

The commission have answered every case reported, and have paid out of their own individual pockets several hundreds of dollars each year above the appropriation in order that the State might be protected from serious loss.

It is well established that the commission has kept our State free from any general epidemic of disease, and prevented the spread of infectious diseases among the horses, cattle and sheep. Other States have recognized ours as being free from trouble and do not quarantine against us as they do against some other districts. This alone is a work performed by the vigilance of the commission, saving the State millions of dollars.

The State Veterinarian, accompanied by one of the commissioners, visited the following places hereinafter named, where cases were reported of horses, cattle or sheep being suspected of having symptoms of contagious or infectious diseases. A detailed report of each case is on file in the secretary's office.

1898.

November—

A. C. Clifford, horses, Gibson County.
Haywood Andell, horses, Vanderburgh County.
Conrad Euber, horses, Vanderburgh County.
Michael Fetterhoff, cattle, Steuben County.
Sylvester Haskins, horses, White County.
Dr. E. R. Bacon, horses, Lake County.

December—

S. E. Ellis, horses, Greene County.
S. Haskins, horses, White County.
A. C. Clifford, horses, Gibson County.
Thos. Linton, cattle, Johnson County.
Jonathan Dungan, cattle, Fayette County.
Samuel Summers, horses, Warrick County.
Joseph Heath, cattle, Benton County.

1899.

January—

Stock Yards, sheep, Marion County.
Cyrus Houtz, horses, Fountain County.
A. C. Clifford, horses, Gibson County.
Cyrus Jenkins, cattle, Clinton County.
C. W. Travis, cattle, Tippecanoe County.
Stock Yards, sheep, Marion County.
Fort Wayne, lawsuit, Allen County.
L. W. Hoggatt, horses, Grant County.

February—

Ad. Abshire, sheep, Delaware County.
Wm. Frye, sheep, Henry County.
Louis Wisehart, sheep, Henry County.
Robert Henry, horses, Vanderburgh County.
John Saunders, sheep, Huntington County.
Stock Yards, sheep, Marion County.
A. C. Clifford, horses, Gibson County.

March—

A. C. Clifford, horses, Gibson County.
Wilson Moffitt, horses, Vanderburgh County.
Straw Board Company, horses, Delaware County.
Stock Yards, sheep, Marion County.
A. C. Clifford, horses, Gibson County.

April—

Stock Yards, cattle, Rush County.
 United States Inspectors, Marion County.
 Robert Thomas, horses, Marion County.
 Robert Thomas (again), horses, Marion County.
 Michael Hamill, horses, Marion County.
 Mathias Zimmer, horses, Jasper County.
 John Hill, horses, Jasper County.
 J. M. Sibrell, mules Spencer County.

May—

A. C. Clifford, horses, Gibson County.
 Corbin Art, mules, Clay County.
 W. W. Smith, cattle, Tippecanoe County.
 Newton Fleming, sheep, Delaware County.
 Len Pitzer, sheep, Delaware County.
 Geo. W. Boxell, cattle, Delaware County.
 McClure & Mitts, sheep, Franklin County.
 Lon Hodson, cattle, Henry County.

June—

A. C. Clifford, horses, Gibson County.
 George E. Shaw, mules, Spencer County.

July—

John Uhlman, horses, Rush County.
 Peter Sloan, horses, Rush County.
 Jerry Wilson, cattle, Delaware County.
 Charles Austin, cattle, Delaware County.
 Rev. M. Howard, cattle, Delaware County.

August—

George Antrim, horses, Jasper County.
 Frank Miller, horses, Delaware.
 Wm. Meeker, horses, Delaware County.
 John Romaine, horses, Vigo County.
 James Weir, cattle, Franklin County.

Number of times visits were made to different counties.	62
Number of horses killed from November 1, 1898, to November 1, 1899.....	21
Total cost to the State.....	\$205 00
Average cost per horse.....	9 76
Number of cattle killed November 1, 1898, to November 1, 1899, cost.....	5 00

Total number of horses killed in different counties:

Vanderburgh	6
Lake	1
White	1
Gibson	6
Warrick	1
Clay	1
Spencer	2
Jasper	1
Vigo	1
Ohio	1
Steuben, cattle	1

The expenses of the commission from November 1, 1898, to November 1, 1899, were as follows:

For horses killed	\$205 00
For cattle killed.....	5 00
For local veterinarians.....	71 00
Commissioner M. S. Claypool, expenses and per diem.	812 53
Commissioner Geo. W. Hall, expenses and per diem..	739 50
Commissioner V. K. Officer, expenses and per diem...	
State Veterinarian F. A. Bolser, expenses and salary.	1,944 75
Secretary Mortimer Levering, expenses and salary...	387 40
	<hr/>
	\$4,165 18

Total amount paid out by the State, the appropriation \$4,000 00

On November 1, 1899, the commission was composed of the following persons, viz.:

Commissioner M. S. Claypool, Muncie, Delaware County, President.

Commissioner Geo. W. Hall, Raleigh, Rush County.

Commissioner V. K. Officer, Volga, Jefferson County.

State Veterinarian F. A. Bolser, New Castle, Henry County.

Secretary, Mortimer Levering, Lafayette, Tippecanoe County.

Reports were sent from some of the southern counties of the State to the State Board of Health reporting repeated outbreaks of anthrax: in some way these reports were published in some of the leading papers of the State and copied in the general press throughout the country. The result was that the Louisville Stock Yards quarantined against our State bringing any cattle across the river to their market. Upon investigation by the State Veterinarian, it was found that the reported anthrax was only a local trouble due to fungi poisoning, and no contagious disease

existed at all. The State Veterinarian was obliged to make three trips to Louisville to show them convincing evidence that we had no anthrax at all, and he finally succeeded in getting them to raise the quarantine and again accept our cattle in their markets.

Respectfully submitted,

M. S. CLAYPOOL,

GEO. W. HALL,

V. K. OFFICER,

Commissioners.

F. A. BOLSER, D. V. S., State Veterinarian.

MORTIMER LEVERING, Secretary.

METEOROLOGICAL TABLES.

TABLE I.

Monthly and Annual Meteorological Summaries for 1899, as Deducted from the Records of Observations Made by the Weather Bureau at Indianapolis, Ind. Appropriate Headings Show the Nature of the Data in the Columns Immediately Underneath.

MONTHS.	Mean Barometer Reduced to Sea Level—Inches.	Mean Temperature—Degrees.	Relative Humidity—Per Cent.	Maximum Temperature—Degrees.	Minimum Temperature—Degrees.	Prevailing Direction of Wind.	Number of Clear Days.	Number of Partly Cloudy Days.	Number of Cloudy Days.	Average Cloudiness During the Month. Scale 0 to 10.	Number of Days on which 0.01 Inch or More of Precipitation Fell.	Total Amount of Precipitation—Inches.	Number of Days on which Min. Temp. Fell below Freezing.
January	30.152	28.2	77	54	—5	S	4	8	19	7.1	11	3.52	24
February . . .	30.116	22.0	74	61	—18	S	5	11	12	6.2	11	2.08	23
March	29.970	36.6	76	70	0	NW	1	13	17	7.5	17	4.18	21
April.	30.044	55.0	71	86	22	S	7	16	7	5.6	7	1.36	6
May	30.018	64.2	70	87	45	S	4	15	12	6.5	16	3.38	0
June	30.048	73.8	66	91	51	S	15	10	5	4.3	9	1.76	0
July	29.984	75.6	60	94	52	SW	11	9	11	5.0	9	3.64	0
August.	30.164	76.4	68	96	59	NE	13	12	6	4.6	6	5.82	0
September . . .	30.068	65.7	67	98	30	NW	11	10	9	5.1	9	2.54	1
October	30.142	60.0	65	86	33	S	13	9	9	4.8	9	2.51	0
November . . .	30.066	46.4	71	69	29	NE	6	10	14	6.7	10	3.31	5
December . . .	30.122	29.8	70	59	0	NW	8	7	16	6.2	8	2.77	
Annual means.	30.076	52.8	70	75.0	25.0	S	..			5.8	..	..	..
Annual totals .	..	.	.		..	..	98	130	137	.	122	36.87	103

TABLE II.

Daily and Monthly Mean Temperature of Indianapolis, Indiana, for 1899. The Daily Means were Made by Adding the Maximum and Minimum Temperature of Each Day Together and Dividing the Sum by Two. The Thermometers are 154.8 Feet Above Ground and Exposed in a Standard Shelter of the Weather Bureau Pattern.

DATE.	Jan.	Feb.	Mar.	Apr.	May.	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	14	13	34	28	76	70	74	74	76	46	49	38
2	26	26	44	31	74	72	78	82	81	59	40	41
3	39	28	46	33	74	78	80	83	81	64	36	35
4	41	19	36	36	62	80	80	80	74	66	39	24
5	22	18	28	39	60	82	72	76	84	58	44	20
6	20	16	12	44	60	82	72	72	86	55	42	32
7	16	10	10	40	63	79	76	74	83	55	43	40
8	30	—1	24	36	58	74	67	68	76	53	48	40
9	34	—13	44	40	61	70	66	74	66	60	51	39
10	28	—8	53	50	62	68	72	76	65	67	58	50
11	26	2	61	58	65	72	77	80	68	64	52	50
12	38	—5	41	66	63	73	82	76	68	66	37	39
13	46	—3	34	69	60	73	79	72	60	73	44	28
14	41	13	40	60	58	78	72	71	56	74	55	24
15	42	26	44	48	64	70	76	70	64	74	49	17
16	44	38	36	44	76	61	77	72	74	71	54	20
17	34	40	42	54	70	65	74	76	76	59	56	34
18	24	38	44	58	58	68	70	78	66	57	60	46
19	24	37	34	59	56	76	75	79	58	54	50	40
20	30	48	32	65	52	76	79	76	57	51	52	31
21	39	44	40	71	56	75	78	78	58	50	50	38
22	40	38	41	68	56	80	76	78	63	62	53	38
23	44	28	31	66	57	80	80	78	68	66	44	37
24	30	23	34	60	62	73	81	79	66	66	42	28
25	32	32	48	62	68	74	76	80	54	66	38	17
26	28	45	35	68	66	76	78	81	50	68	41	16
27	11	27	36	72	74	76	80	79	50	64	36	21
28	18	40	28	76	74	75	74	76	57	52	40	18
29	2	...	33	74	68	69	77	76	43	43	42	10
30	10	...	42	76	67	68	72	76	42	49	51	6
31	2	...	32	...	70	...	71	77	...	52	...	7
Mean	28.2	22.1	36.7	55.0	64.2	73.8	75.6	76.4	65.7	60.1	46.5	29.8

TABLE III.

*Daily and Monthly Precipitation at Indianapolis, Ind., for 1899,
the Rain Gauge 146 Feet Above Ground.*

DATE.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1 . . . . .	.00	.00	.18	†	.01	.55	.00	.10	.50	.00	†	†
2 . . . . .	.00	.00	.08	.00	.00	.00	.00	2.53	.00	.05	1.02	.00
3 . . . . .	.00	.16	.18	.00	†	.00	.00	†	.00	.00	.51	.00
4	1.51	.03	.07	.00	.00	.00	.00	.00	.00	.00	.00	†
5 . . . . .	.03	.20	.57	.00	.00	.00	.05	.98	.00	.05	.00	†
6 . . . . .	.04	.03	.01	†	.09	.00	†	†	.03	.00	.09	.00
7 . . . . .	.00	.02	.00	.27	.14	.10	†	.00	.52	.00	.00	.00
8 . . . . .	.00	.00	.00	.02	.62	.02	†	†	.51	.00	.09	.08
9 . . . . .	.11	†	.00	.00	.00	.01	.00	1.52	.09	.00	.00	†
10 . . . . .	.00	†	.00	†	.00	.12	.00	.08	†	.02	.00	†
11 . . . . .	.00	.06	.00	.00	†	.00	†	†	.00	.32	.00	1.34
12	†	.00	.16	.00	.42	.00	.00	.63	.00	.00	.00	.16
13 . . . . .	.47	.00	.00	.00	†	.02	.74	.00	.00	.00	.04	.00
14	1.22	.00	†	.08	.91	.16	.01	.00	.00	.00	.02	.00
15 . . . . .	.00	.00	†	.07	.00	.00	.21	.00	.00	.00	†	†
16 . . . . .	.00	.00	.00	.00	.00	.00	.14	.00	.00	.00	.00	.00
17 . . . . .	.03	.00	.00	.00	.16	.00	.00	.00	.00	.00	.16	.00
18	†	.01	.87	.34	.01	.00	.00	.00	.44	†	.23	.13
19 . . . . .	.00	†	.51	.12	.00	.00	.00	.00	.09	.04	.05	.20
20 . . . . .	.00	.00	.00	.00	.00	†	.00	.00	.00	.00	.00	.00
21 . . . . .	.00	.60	.40	.00	.16	.68	.00	.00	.00	.00	.02	.00
22 . . . . .	.00	†	.25	.00	.01	.00	.09	.00	†	.00	.42	.00
23 . . . . .	.00	.06	.00	.03	.00	.00	.00	.00	.05	.00	.74	.16
24 . . . . .	.01	†	.00	.51	.00	†	.11	.00	.06	.00	.08	.00
25 . . . . .	.00	.11	.15	.00	.00	†	1.22	.00	.34	.00	.00	†
26 . . . . .	.04	.79	.00	.00	.05	.00	.00	†	.00	.00	.00	.00
27	†	†	.16	.00	†	.00	.40	.00	.00	.16	.00	.00
28	†	†	.88	.00	.01	.00	.78	.00	†	1.05	.00	.00
29 . . . . .	.02	. . .	.01	.00	.74	.10	.00	.00	.00	.01	†	.00
30 . . . . .	.04	. . .	.18	.00	†	.00	.00	.00	.00	.00	.00	.00
31 . . . . .	.00	. . .	.02	. .	.54	. .	.00	.00	. .	.00	. .	.00
Mean	3.52	2.08	4.18	1.36	3.38	1.76	3.64	5.82	2.54	2.51	3.31	2.77

† indicates trace of precipitation (less than 0.01 inch).

TABLE V.

Annual Means for the Years 1872 to 1899, Arranged for Comparative Purposes, and Compiled from the Records of the U. S. Weather Bureau, Department of Agriculture, at Indianapolis, Ind.

YEAR.	Mean Barometer Reduced to Sea Level—Inches.	Mean Temperature—Degrees.	Mean Relative Humidity—Per Cent.	Maximum Temperature During the Year—Degrees.	Minimum Temperature During the Year—Degrees.	Prevailing Direction of Wind.	No. of Clear Days.	No. of Fair Days.	No. of Cloudy Days.	Av. Amount Cloudiness—Scaled to 10.	No. of Days on Which 0.01 Inch or More of Precipitation Fell.	Total Amount of Precipitation.	Greatest Precipitation in Any (Continuous) 24 Hours—Inches.	No. of Days on Which the Maximum Temperature Was Below Freezing.	No. of Days on Which the Minimum Temperature Was Below Freezing.	No. of Days on Which the Temperature Was Above 80 Degrees.
1872	30.044	50.8	67.5	96.0	-11.0	SW	95	142	139	5.0	122	34.07	3.71	49	120	17
1873	30.004	52.0	69.2	95.0	-13.0	SW	97	141	127	5.0	145	52.32	2.73	38	99	9
1874	30.037	45.0	63.0	97.0	-2.0	NW	97	150	118	5.0	120	43.60	2.61	17	83	27
1875	30.005	50.5	66.1	92.0	-18.5	W	81	138	146	5.0	155	54.58	2.86	44	107	5
1876	29.997	53.2	68.1	93.0	-16.0	W	83	126	157	6.0	155	57.53	2.70	30	101	9
1877	30.008	54.0	67.2	90.0	-11.0	SW	96	141	126	5.0	139	39.08	2.07	20	84	0
1878	29.946	55.4	64.6	96.0	-12.0	SE	84	159	122	6.0	148	34.62	2.03	17	68	13
1879	30.036	53.9	64.4	94.0	-22.0	S	94	135	136	5.0	122	42.88	2.33	27	96	12
1880	30.130	54.4	65.4	94.0	-13.0	W	106	145	115	5.0	123	50.99	2.00	26	19	9
1881	30.024	51.9	67.4	101.0	-6.0	SW	100	140	125	5.0	112	48.74	4.30	28	91	31
1882	30.045	53.3	71.1	94.0	-10.0	NW	107	141	117	5.3	141	53.68	3.02	19	78	4
1883	30.059	51.6	66.2	92.0	-11.0	SW	96	157	111	5.4	164	54.12	3.71	36	106	6
1884	30.044	52.5	67.6	92.8	-25.0	S	99	144	123	5.6	159	39.99	2.16	40	91	5
1885	30.019	49.3	73.9	95.1	-11.3	SW	92	163	120	5.5	147	39.51	2.67	42	111	15
1886	30.039	51.0	71.3	94.3	-16.0	S	108	150	107	5.3	138	39.88	2.11	47	127	13
1887	30.044	52.7	66.0	100.0	-11.3	NW	113	146	106	5.2	119	33.08	1.89	31	120	34
1888	30.082	50.6	68.8	97.5	-6.0	SW	95	119	184	5.1	124	41.36	2.62	36	103	17
1889	30.062	53.1	69.3	92.0	-1.0	SW	113	133	157	5.5	113	38.41	2.44	18	71	5
1890	30.066	54.0	68.6	96.9	-4.4	Cal	77	144	144	6.2	189	54.87	4.41	25	72	23
1891	30.066	53.5	69.0	94.0	-3.0	NW	113	108	114	5.7	145	38.23	2.86	25	80	25
1892	30.079	52.0	71.0	97.0	-5.0	NW	95	128	143	5.9	150	39.77	2.73	41	104	16
1893	30.041	52.0	68.0	77.0	-15.0	NW	113	115	137	5.6	144	39.35	1.60	44	114	28
1894	30.069	54.6	67.6	99.0	-7.0	NW	108	133	124	5.6	127	31.13	2.69	26	83	39
1895	30.076	52.1	67.7	100.0	-14.0	SW	126	124	116	6.3	126	33.54	6.90	46	108	39
1896	30.043	54.1	66.2	98.0	-6.0	NW	104	142	121	6.6	135	39.84	2.34	24	98	25
1897	30.074	53.0	71.4	99.0	-14.0	NW	140	112	113	6.1	137	42.15	3.23	24	98	29
1898	30.050	53.6	71.0	94.5	-4.3	NW	98	110	148	6.0	132	44.10	2.89	27	94	19
1899	30.076	52.8	70.0	97.7	-13.2	S	93	130	137	6.3	122	36.57	1.03	35	103	24

TABLE VI.

Monthly Mean Atmospheric Pressure Reduced to 32° Fahrenheit and the Level of the Sea, for Each Year of the Period 1872 to 1899, Inclusive, as Recorded at the Office of the U. S. Weather Bureau of Indianapolis, Ind.

MONTH.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.
January	30.130	30.056	30.120	30.232	30.107	30.160	30.022	30.151	30.028	30.136	30.159	30.162	30.188	30.156
February	30.008	30.044	30.099	30.129	30.070	30.156	30.117	30.112	30.049	30.092	30.101	30.283	30.060	30.026
March	30.043	30.080	30.041	29.999	29.982	30.013	29.912	30.073	30.059	29.824	30.088	30.057	30.040	30.095
April	29.960	29.896	30.016	29.064	29.976	29.898	29.746	29.969	29.974	29.963	30.927	29.965	29.948	30.014
May	29.988	29.895	29.940	29.922	29.968	29.992	29.904	29.951	29.946	29.967	29.955	29.940	29.966	29.909
June	29.976	29.905	29.925	29.948	29.881	29.907	29.896	29.954	29.974	29.946	29.908	29.931	30.009	30.013
July	29.764	29.982	29.954	29.935	29.957	29.931	29.912	29.827	29.957	29.985	30.012	30.012	29.913	29.964
August	30.082	30.013	29.952	29.945	30.001	29.926	29.876	29.951	29.976	30.005	29.981	30.050	30.034	29.946
September	29.997	30.632	30.020	30.020	29.954	29.997	30.050	30.081	30.083	30.017	30.067	30.043	30.052	30.025
October	30.085	30.062	30.083	29.999	29.972	29.983	30.028	30.108	30.062	30.130	30.034	30.090	30.153	29.973
November	30.112	30.010	30.116	30.037	29.980	30.038	30.010	30.078	30.207	30.163	30.177	30.161	30.131	30.001
December	30.218	30.125	30.165	29.936	30.109	30.097	30.082	30.080	30.124	30.180	30.152	30.136	30.156	30.104

MONTH.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.
January	30.053	35.081	30.250	30.056	30.211	30.084	30.146	30.064	30.151	30.085	30.204	30.190	30.070	30.152
February	30.114	30.156	30.086	30.174	30.080	30.056	30.109	30.166	30.176	30.210	30.018	50.091	30.138	30.116
March	29.975	30.055	30.121	30.004	30.066	30.037	30.084	30.065	30.084	30.088	30.014	30.052	30.052	29.970
April	30.029	30.099	30.154	30.018	30.096	30.022	30.090	29.942	30.041	29.999	30.092	30.082	29.952	30.044
May	29.925	29.974	29.940	29.974	29.936	30.092	29.945	29.926	29.966	30.056	29.996	30.040	30.000	30.018
June	29.951	29.992	29.954	30.012	29.990	29.934	29.950	29.984	30.016	30.054	29.994	29.980	30.031	30.048
July	29.963	29.975	30.047	29.988	30.015	30.028	30.078	29.990	30.034	30.022	30.042	29.942	29.999	29.984
August	29.982	29.994	30.041	30.098	30.063	30.000	30.022	29.994	30.024	29.972	30.058	30.000	29.998	30.164
September	30.084	30.076	30.082	30.054	30.105	30.150	30.118	30.006	31.060	30.078	30.042	30.161	30.044	30.068
October	30.198	30.086	30.014	30.133	29.974	30.149	30.108	30.071	30.001	30.130	30.084	30.106	30.068	30.142
November	30.051	30.094	30.155	30.102	30.111	30.110	30.133	30.108	30.146	30.160	30.188	30.126	30.120	30.066
December	30.169	30.095	30.142	30.134	30.128	30.129	30.167	30.179	30.164	30.080	30.226	30.128	30.130	30.122

TABLE VII.

Mean Temperature and Total Monthly Precipitation for Each Month of the Period 1872 to 1899, Inclusive. Compiled from the Records of the U. S. Weather Bureau at Indianapolis, Ind.

MONTHLY MEAN TEMPERATURE IN DEGREES, FAHRENHEIT.

MONTH.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.
Jan . .	26.6	24.5	35.5	20.0	38.6	27.8	34.5	26.5	45.9	23.7	31.6	24.5	21.6	22.5	21.2	24.4	23.3	34.1	37.4	34.2	23.8	17.9	34.6	22.9	30.0	25.0	33.8	28.2
Feb . .	29.6	30.3	35.6	21.2	37.0	39.2	39.0	30.1	38.7	29.8	42.3	32.0	34.7	20.5	23.2	31.6	30.5	27.0	38.8	34.6	36.4	30.0	29.4	21.7	32.4	32.5	32.3	22.0
March .	35.0	37.9	41.6	37.4	37.5	35.5	49.9	42.5	41.6	36.8	44.8	36.1	41.1	33.0	39.4	38.2	35.7	44.4	36.0	35.5	37.4	40.2	47.4	38.8	36.0	42.9	46.8	36.6
April .	55.0	51.2	45.8	49.3	52.0	53.8	85.6	52.3	55.2	47.5	53.3	50.3	50.2	51.5	54.6	52.3	52.6	53.3	53.6	55.4	50.6	52.0	54.0	55.2	60.0	50.8	50.4	55.0
May . .	64.4	63.9	66.6	62.3	65.7	61.9	81.6	66.2	68.4	70.2	58.5	60.9	62.1	60.5	64.3	67.3	60.5	61.6	61.6	59.6	60.0	59.9	61.7	63.8	70.8	58.0	63.4	64.2
June . .	73.0	78.7	76.2	70.8	71.9	71.5	69.9	71.4	74.3	72.8	71.6	71.5	73.2	68.8	69.2	73.8	72.9	67.4	76.8	74.0	74.6	72.8	74.6	75.6	71.3	70.0	73.2	73.8
July . .	77.7	75.3	74.3	75.6	77.7	75.8	79.1	79.5	75.9	79.4	72.6	75.1	73.7	76.3	74.3	80.6	75.2	74.2	75.7	71.9	75.6	79.1	76.4	74.2	75.9	77.0	76.8	75.6
August .	75.9	74.8	75.5	70.2	75.0	73.1	75.2	72.6	75.6	79.0	73.0	70.4	72.3	70.0	72.9	73.3	71.1	71.4	71.1	72.1	74.2	73.4	74.8	76.2	74.7	72.3	74.6	76.4
Sept . .	66.7	63.8	69.6	61.1	64.4	66.3	67.0	61.7	64.2	73.5	65.5	63.2	71.6	61.9	66.6	65.8	60.9	64.5	62.9	70.6	67.4	69.0	69.8	70.8	61.2	71.4	70.2	65.7
Oct . .	53.3	49.8	55.0	50.8	51.1	58.2	54.0	62.3	52.9	60.2	58.8	54.8	58.3	50.4	55.3	50.2	48.5	50.8	55.0	54.6	56.4	55.7	55.9	49.4	52.2	61.2	53.4	60.0
Nov . .	35.3	37.0	42.1	38.9	41.1	42.6	44.9	45.4	31.2	42.8	43.3	45.0	41.5	41.4	39.3	40.5	42.4	40.9	46.5	39.4	38.2	41.0	39.1	42.3	44.6	43.6	39.8	46.4
Dec . .	23.8	37.2	35.3	41.2	22.6	46.3	26.9	35.6	24.2	40.2	30.4	34.4	29.9	32.0	25.2	30.8	34.0	46.7	33.1	40.6	30.0	32.8	35.8	34.1	36.1	31.2	29.4	29.8

TOTAL MONTHLY PRECIPITATION, IN INCHES AND HUNDREDTHS.

Jan . .	1.17	4.50	3.75	1.01	5.94	1.56	2.39	1.47	6.32	2.10	3.64	1.32	1.05	3.31	4.02	1.48	2.81	2.52	10.20	2.00	1.55	2.77	1.43	8.12	1.60	3.71	4.93	3.52
Feb . .	1.41	2.85	4.17	1.88	4.49	1.21	2.10	2.17	3.16	6.33	7.24	7.19	4.73	1.54	1.51	4.61	2.45	1.29	5.28	5.97	3.53	6.16	4.90	0.84	2.47	2.37	1.47	2.08
March .	1.31	3.90	5.79	5.23	1.23	5.24	1.23	3.36	4.03	4.01	6.11	3.25	3.01	0.82	2.85	2.78	4.26	2.15	4.46	5.77	1.93	1.69	2.82	1.30	3.08	5.85	9.90	4.18
April .	3.26	5.91	4.44	1.29	2.27	3.11	5.51	2.25	6.43	2.60	3.64	2.73	2.89	5.28	3.09	3.92	4.05	2.07	4.58	2.80	6.33	8.60	2.72	1.96	1.27	4.83	1.73	1.36
May . .	3.22	3.49	4.03	5.13	6.11	2.09	3.21	3.34	8.22	3.78	7.65	4.02	4.80	3.66	3.82	2.39	4.73	5.76	3.61	1.41	8.83	3.15	4.52	1.07	3.56	4.39	2.59	8.89
June . .	3.28	3.71	5.25	12.21	7.54	6.21	2.75	2.91	8.48	3.92	9.35	4.59	4.11	5.71	4.92	2.45	2.65	4.88	4.45	2.90	3.84	3.02	3.76	1.49	3.04	8.70	1.77	1.76
July . .	11.00	11.28	3.53	13.12	7.48	4.19	4.54	2.40	2.26	0.82	3.43	6.12	6.03	1.43	2.27	1.41	3.33	6.98	0.97	1.92	2.93	3.02	3.76	1.49	3.04	8.70	1.77	1.76
August .	2.69	1.32	2.90	3.66	5.86	4.13	2.42	5.71	2.67	0.97	4.51	2.48	0.46	6.83	6.70	3.16	6.84	6.64	6.00	5.79	1.39	0.83	1.35	2.87	5.72	5.70	5.52	3.64
Sept . .	2.81	1.76	2.04	1.84	3.85	2.04	3.35	6.94	1.86	3.21	0.72	2.72	3.09	3.60	3.13	2.11	1.23	3.79	7.31	0.74	2.42	8.01	1.82	1.91	8.91	0.42	2.23	5.82
Oct . .	1.07	5.27	0.46	2.67	4.42	3.82	4.74	1.84	3.54	6.11	2.18	8.56	2.31	3.25	1.20	0.55	4.03	1.70	4.02	1.18	0.28	8.01	2.51	0.88	8.12	0.79	4.23	2.51
Nov . .	0.80	2.55	4.82	3.04	2.26	3.64	2.87	6.82	2.58	9.86	2.50	6.40	1.46	2.71	3.87	3.71	6.07	4.97	3.35	5.06	4.90	3.25	1.55	0.81	4.19	6.87	2.79	3.31
Dec . .	2.10	6.90	2.79	4.01	0.80	2.45	3.95	5.10	1.44	5.40	2.53	4.34	6.05	2.15	2.20	4.52	1.91	2.76	1.64	2.96	1.84	2.23	2.09	4.86	1.13	3.09	2.04	2.77

WEATHER AND CROPS.

U. S. DEPARTMENT OF AGRICULTURE, CLIMATE AND CROP SERVICE OF THE WEATHER BUREAU, INDIANA SECTION.

EFFECT OF THE WEATHER ON THE CROPS DURING THE SEASON OF 1899.

January.—Wheat sown early in the autumn grew rapidly and began wintering under favorable conditions. and, at the end of the month, it was in very good condition, being deep-rooted and vigorous. Much wheat had been sown late, because of unfavorable weather; it came up late, and, in most fields, it was only above the ground; during the cold weather in December it was protected in most fields by snow covering, but later in the month, many fields being bare, freezing and thawing did some injury; the tops of the wheat above ground became brown in many localities, but the roots under ground were apparently sound and uninjured.

February.—During the exceedingly cold weather, at the beginning of the month, the wheat was well protected by snow in most localities, and, consequently, it was but little injured, except in the northern portion, where, but little snow having fallen, many fields of wheat appeared to have been injured. In general, in most fields, the crop was in good condition; in some localities it promised better than it had done in many years; the tops of the plants were brown, but the roots were sound and the plant was deep-rooted and vigorous, especially the early-sown; late-sown was still small. Rye was in fair condition. Fall-sown timothy was green and vigorous. Much clover was frozen. Fruit buds were possibly much injured by the severe weather, especially cherries and, most so, peaches; the latter seem to be entirely ruined; berry bushes of all kinds and grapevines were injured.

March.—Cold, unseasonable weather prevailed during March, with frequent rain or snow, and farm work was much delayed; in the southern half of the State some oats, grass and clover were sown; few field potatoes were planted and few gardens made; in the northern portion the ground was still deeply frozen and covered with snow at the end of the month. Little or no plowing could be done, as the ground was too wet and in most unfavorable condition. Trees were without verdure, and

meadows, clover and timothy were brown, and only began to show green during the last few days of the month. In the southeastern counties a few tobacco beds were made, but the plants did not advance well because of the lack of sunshine. Early-sown wheat continued in fair condition, although it suffered much by freezing and thawing, and much of the late-sown is winter-killed. Rye and barley were in fair condition.

April.—Continued cold weather during the earlier part of the month, and the bad condition of the ground, delayed farm work; but little plowing was done; few oats and barley were sown and few potatoes planted, and only a small number of tobacco beds were made; trees were without foliage, and everything looked brown and bare. From the middle of the month warmer and more seasonable weather caused a sudden change; meadows and pasturage turned green, trees were rapidly covered with bright green foliage; buds burst, and fruit trees were heavy with blossoms before the end of the month; all vegetation grew rapidly, and plowing, seeding and planting continued uninterruptedly. Wheat, which was not injured, had improved and grown rapidly; rye, barley, timothy and clover grew well; many fields of oats were sown, and most potatoes were planted, and some oats and potatoes were coming up well; tobacco plants were growing nicely; plowing advanced rapidly, and some corn was planted.

May.—In general, the weather during the month was favorable for growing crops and farm work; most corn was planted, and some fields were under cultivation; the tobacco fields were ready, and the plants were large enough for transplanting, but the ground was too dry, and planters had to wait until the last few days of the month, when sufficient rain permitted transplanting. Rye and barley had headed and were maturing well. Oats, meadows, timothy and pasturage were in good condition. The clover harvest was delayed by the rains the last few days; much white-top was in the fields. Potatoes were in bloom.

June.—Very favorable weather prevailed for harvesting, farm work in general and for growing crops. Rains occasionally interrupted harvesting and threshing, and large hail did some injury to corn and orchards in the central and northern portions. At the beginning of June clover cutting began; wheat improved rapidly, the fly and rust did injury in some localities; corn did not grow well, the fields were weedy; tobacco plants were all transplanted; rye and barley matured well; potatoes were in bloom; a large number of tomato plants were set out; fruit promised well, but apples fell off much. At the end of the month wheat, rye and barley harvests progressed, and threshing had begun; in some wheat fields the yield was good, the grain was plump and heads well filled; in many other fields the yield was poor, both in quantity and quality; rye and barley yielded well; good crops of hay were secured; corn had grown rapidly, with good cultivation, most fields were laid by; oats were heading, promising well; tobacco grew well, some plants were injured by insects; early potatoes promised well, and late potatoes were being planted.

July.—Favorable weather prevailed during the month; showers occurred at intervals, but in some of the southern counties the rains were badly distributed. The wheat crop was nearly all in shock during the earlier part of the month, and threshing advanced rapidly. The oat harvest began near the middle of the month. Rye was in shock in the southern portion at the beginning of the month, and in the central and northern portions the harvest began at a later period. A good crop of hay was secured, and millet and seed clover were in excellent condition. Corn had grown rapidly by the close of the month. Tobacco grew well on good ground and in fields where there was good cultivation; the plant in Switzerland County needed rain. Potatoes, tomatoes, melons and all kinds of vegetables were abundant. Apples continued falling, but a good crop was still promised. Plowing for wheat began nearly everywhere, but was delayed by warm weather and the unfavorable condition of the ground.

August.—Warm, sunny weather prevailed; showers were frequent during the earlier part of the month, but were badly distributed, and, during the latter part of the month, rain was much needed for growing crops and pasturage and to keep the ground in good condition for plowing. Corn grew and matured rapidly; it eared well and promised a good yield, and, at the end of the month, some had been cut. Tobacco grew rapidly, and cutting began the latter part of the month. Potatoes grew well, but needed rain to insure a good crop. Buckwheat was in good condition; it was blooming in the southern portion at the end of the month. Millet promised well. A good crop of sorghum cane was cut in the southern portion. Vegetables and pickles were plentiful; tomatoes, in some fields, yielded well. Wheat and oat threshing was finished. Plowing for wheat progressed well during the earlier part of the month.

September.—The weather during the first week of the month was exceedingly hot and dry; cooler weather prevailed during the latter part and rain fell in localities, especially in the northern portion. Corn matured rapidly, and cutting began early, and, at the end of the month, most of the crop was in shock, and husking of a very good crop had begun; early-planted corn dried up prematurely in most fields, lessening, thereby, the prospect for a good yield. A fair crop of tobacco was housed during the month in good condition. Potato digging began before the end of the month; the dry weather lessened the yield. A fair bean crop was gathered; tomatoes and other vegetables, injured by the dry weather, were not promising well. Rye sown in dry ground was in poor condition. Clover hulling continued; in some localities it had ended, the yield was not very good. Fall plowing and wheat sowing were much delayed until the last week of the month, when rains improved the ground; the early-sown came up.

October.—The warm, dry weather during October was exceedingly favorable for the curing, husking and cribbing of a very good corn crop

and for general farm work. Rains in localities, during the earlier part of the month, softened the ground for plowing and wheat sowing; the grain germinated well, and, at the end of the month, most of the fields were a bright green. Tobacco cured quite well, and, by the end of the month, some of the crop had been stripped. Timothy sowing was delayed; at the end of the month the meadows began to look green; both old and young clover were doing well; grass was short and needed rain in most localities, but copious rains on the 27th and 28th were of great benefit.

November.—Warm weather and good local rains were very favorable to all crops; wheat grew rapidly; late-sown came up nicely and, and, in most fields, it was in good condition for wintering, being deep-rooted and healthy; the Hessian fly injured the crop in many fields in all parts of the State. Pasturage was green, and stock feeding began later than usual. Rye and barley were in very good condition. Farm work progressed, with very few interruptions.

December.—The greater portion of the month the weather was mild and favorable for winter wheat. During the cold nights in the middle of the month fields were well covered with snow, but during the last week of the month, when very cold weather prevailed, the fields were bare, and it is feared the freezing and thawing injured the wheat, except in the eastern and southern portions, where it was protected by snow; in some fields, especially in the southern portion, the wheat never looked better; it was well rooted and looked green and healthy; in other fields it looked brown and was apparently in bad condition. The Hessian fly was injuring early-sown wheat in many fields. Corn was not all husked. Rye was not in very good condition. Live stock was healthy and in good condition.

ANNUAL SUMMARY.—1899.

The annual average temperature for the State, 52.7 degrees, is 0.7 degrees above the normal, and a slight excess occurred in all portions of the State and at nearly all stations of observation. Exceedingly warm months were October, with an excess over the normal of 5.6 degrees, November, with an excess of 4.8 degrees, and during the first eight days of September, when the highest temperatures were observed nearly everywhere, ranging from 92 degrees to 106 degrees. During the four months of the year the average temperature was below the normal; exceedingly so during the month of February, when the deficiency for the State was 8.7 degrees, and the local deficiencies ranged from 4.2 degrees to 12.6 degrees.

The precipitation was deficient most everywhere; most so in the central portion. The average amount for the State, 35.05 inches, was 4.10 inches below the normal. In six months the precipitation was in excess, and in the other six months it was deficient. The total amount of snow was greater than in other years.

The Seasons.—The winter had been quite cold; its average temperature, 26.4 degrees, was 3.7 degrees below the normal. In January the average temperature, 28.6 degrees, was 1.9 degrees in excess of the normal, but December, 1898, and February, 1899, were very cold months, especially during the month of February, when, from the 7th to the 14th, a minimum temperature much below zero caused an average deficiency of 8.7 degrees for that month. The weather, by its continued low temperature, was the coldest in any month of February on record.

During the spring the temperature was above the normal; in March there occurred a deficiency, but in April and May the average temperature was excessive.

The summer was warm; the average temperature, 74.9 degrees, was 1.8 degrees above normal, and an excess occurred in all summer months.

Autumn was a very warm season; the average temperature, 57.0 degrees, was 3.4 degrees in excess. There was a slight deficiency in September, but October and November were very warm.

The precipitation was deficient in all seasons. The greatest deficiency, 1.98 inches, is noted in autumn, and the least deficiency, 0.58 inches, in summer. The average annual amount for the State, 34.17 inches, is 4.96 inches below the normal. There was a slight excess of precipitation, ranging from 0.02 to 0.70 inch, in January, March, July, August and October. In the other months the deficiencies range from 0.21 to 1.75 inches.

THE SEASONS OF 1899.

*The Year Begins with December, 1898, the Beginning of Winter,
and Ends November 30, 1899, the End of Autumn.*

MONTHS AND SEASONS.	TEMPERATURE, DEGREES FAHRENHEIT.				PRECIPITATION, INCHES.			NUMBER OF DAYS—			
	Mean.	Normal.	Departure from Normal.	Monthly Mean Range.	Total.	Normal.	Departure from Normal.	Clear.	Partly Cloudy.	Cloudy.	Rainy.
December, 1898 . . .	28.8	33.0	−4.2	61	2.28	2.76	−0.48	11	7	13	8
January, 1899	23.6	26.7	+1.9	62	3.23	3.07	+0.16	9	10	12	8
February	21.9	30.6	−8.7	81	2.27	3.09	−0.82	9	8	11	7
Winter, 1899	26.4	30.1	−3.7	68	7.78	8.92	−1.14	29	25	36	23
March	37.5	38.6	−1.3	71	4.46	3.76	+0.70	6	10	15	13
April	54.4	52.6	+1.8	69	1.60	3.35	−1.75	13	10	7	6
May	64.4	62.0	+2.4	46	3.96	4.17	−0.21	9	11	11	12
Spring, 1899	52.1	51.1	+1.0	62	10.02	11.28	−1.26	28	31	33	31
June	73.5	72.1	+1.4	47	2.86	3.61	−0.75	16	8	6	8
July	75.1	74.9	+0.2	40	3.28	3.13	+0.15	14	10	7	8
August	76.1	72.9	+3.7	40	3.03	3.01	+0.02	18	9	4	6
Summer, 1899	74.9	73.1	+1.8	42	9.17	9.75	−0.58	48	27	17	22
September	65.3	66.0	−0.7	58	1.75	3.02	−1.27	15	9	6	6
October	59.2	53.6	+5.6	42	2.91	2.37	+0.54	16	7	8	6
November	46.0	41.2	+4.8	42	2.54	3.79	−1.25	10	8	12	8
Autumn, 1899	57.0	53.6	+3.4	47	7.20	9.18	−1.98	41	24	26	20
Year	52.6	52.0	+0.6	55	34.17	39.13	−4.96	146	107	112	96

CLIMATOLOGICAL DATA FOR THE YEAR 1899.

CLIMATOLOGICAL DATA.

735

STATIONS.	COUNTIES.	TEMPERATURE (DEGREES FAHRENHEIT).					PRECIPITATION (INCHES).					SKY.			Prevailing Direction of Wind.				
		Elevation, Feet.	Length of Record, Years.	Annual Mean.	Highest.	Date.	Lowest.	Date.	Total for the Year.	Greatest Monthly.	Month.	Least Monthly.	Month.	Total Snowfall.		Number Rainy Days.	Number Clear Days.	Number Partly Cloudy Days.	Number Cloudy Days.
SOUTHERN.																			
Bedford.	Lawrence	681	6	..	105	Sept. 4	-18	Feb. 10	6	..	4.76	June	0.98	July	12.3	..	..	..	W.
Boonville.	Warrick	416	1	..	..	..	-20	Feb. 9	1	..	..	..	..	Sept.	..	76	177	91	W.
Bright	Dearborn	..	4	53.5	104	Sept. 6	-21	Feb. 9	4	38.66	5.89	Mch.	0.48	Sept.	..	113	195	84	sw
Butler	Jennings	..	15	54.0	103	Sept. 6	-26	Feb. 13	15	43.63	5.43	Mch.	1.61	Nov.	26.2	105	170	69	..
Columbus	Bartholomew	632	16	53.1	102	Sept. 5	-27	Feb. 13	16	35.09	4.45	Aug.	1.41	Sept.	20.1	119	173	88	..
Edwardsville.	Floyd	..	6	56.9	94	Sept. 5, 7	-18	Feb. 13	6	46.01	7.35	Mch.	0.78	Sept.	20.1	119	173	88	..
Evansville	Vanderburgh	386	5	57.0	..	..	..	..	5	40.49	6.57	Mch.	1.02	Sept.	16.7	120	158	110	..
Greensburg.	Decatur	954	4	53.5	100	Sept. 5	-24	Feb. 13	4	57.56	5.01	July	0.09	Sept.	26.3	64	174	73	..
Jasper	Dubois	..	..	..	98	Sept. 6	-15	Feb. 9	..	..	..	..	..	..	..	..	..	..	..
Jeffersonville.	Clark	455	10	56.2	98	Sept. 5, 7	-13	Feb. 9	10	40.90	6.66	Mch.	0.87	Sept.	19.0	125	183	128	..
Madison	Jefferson	460	8	55.4	101	Sept. 6	-20	Feb. 13	8	42.12	5.56	Mch.	0.78	Sept.	20.3	106	169	62	..
Marengo	Crawford	363	18	54.2	99	Sept. 6	-28	Feb. 13	18	54.88	8.43	Mch.	0.88	Sept.	31.7	107	133	104	..
Mt. Vernon.	Posey	410	11	..	102	Sept. 7	-20	Feb. 9	11	..	6.87	Mch.	1.37	Sept.	..	..	157	76	..
Paoli	Orange.	611	1	54.5	98	Sept. 6	-20	Feb. 9, 13	1	49.12	7.68	Aug.	1.58	Sept.	30.7	119	195	100	..
Princeton	Gibson.	481	17	54.8	105	Sept. 6	-20	Feb. 9	17	35.40	5.43	Mch.	1.15	Apr.	40.5	69	195	70	..
Rockport.	Spencer	..	..	..	99	Aug. 19	..	..	..	..	..	..	..	..	..	..	..	..	..
Salem.	Washington.	570	2	54.6	98	Sept. 6	-27	Feb. 13	2	..	5.46	Mch.	0.92	Sept.	..	..	..	..	..
Scottsburg	Scott.	610	6	55.4	99	Sept. 6	-25	Feb. 13	6	42.72	6.00	July	0.86	Sept.	24.0	90	..	..	..
Seymour	Jackson	525	12	..	101	Sept. 6	-20	Feb. 10	12	..	..	..	..	..	..	..	..	..	..
Vevay	Switzerland	431	35	55.8	100	Aug. 2	-22	Feb. 13	35	54.50	8.15	May	0.55	July	40.0	81	125	65	..
Vincennes	Knox	484	6	55.7	106	Sept. 7	-19	Feb. 9	6	38.50	4.91	June	0.81	Sept.	27.5	84	229	0	..
Washington	Daviess	..	5	56.9	101	Aug. 3, 4	-19	Feb. 9	5	41.24	6.87	Aug.	1.44	Feb.	16.5	102	123	155	..
Worthington.	Greene	540	18	54.2	106	Sept. 6	-24	Feb. 10, 13	18	33.86	5.07	May	0.71	Sept.	20.2	99	123	87	..
Mean.	..	..	16	54.8	106	Sept. 6, 7	-28	Feb. 13	16	41.19	5.47	Mch.	1.17	Sept.	24.2	99	168	87	..

Delphi	Carroll.	688	15	50.9	100	Sept.	5	-19	Feb.	9	15	35.60	4.50	May	0.80	Apr.	50.0	110	96	110	159	. .
Fairmount	Grant . . . . .	. . .	2	50.7	102	Sept.	5	-19	Feb.	. .	2	37.58	6.06	Aug.	0.70	Apr.	41.8	109	167	131	67	sw.
Ft. Wayne	Allen	775	6	50.6	97	Sept.	5	-22	Feb.	9	6	20.38	4.07	May	0.55	Jan.	13.3	107	87	172	106	. .
Hammond	Lake.	741	6	51.3	100	Sept.	5	-17	Feb.	8	6	34.58	5.05	Mch	0.71	Apr.	61.5	117	208	68	89	sw.
Huntington	Huntington	840	7	52.0	96	Sept.	5	-17	Feb.	9	7	36.73	4.98	July	0.33	Apr.	25.0	118	95	162	108	sw.
Kokomo	Howard	661	20	51.5	101	Sept.	5	-22	Feb.	9	20	30.84	4.35	July	0.66	Apr.	26.7	111	113	120	132	s.
Lafayette.	Tipperance . . . . .	. . .	1	. . .	103	Sept.	5	-21	Feb.	14	1	28.61	4.47	May	0.83	Apr.	59.6	108	146	92	127	n.
Laporte.	Laporte	620	17	51.0	97	Sept.	5	-18	Feb.	8, 9	17	24.84	4.31	May	0.97	Sept.	26.6	107	. .	. .	. .	. .
Logansport.	Cass	814	13	51.4	101	Sept.	5	-19	Feb.	9	13	35.63	4.90	Mch.	1.49	Apr.	35.2	114	87	165	113	sw.
Marion	Grant	785	. .	51.1	100	Sept.	5	-18	Feb.	9	2	31.50	5.30	Mch.	0.40	Apr.	42.5	62	157	124	84	e, w.
Markle	Huntington	657	2	52.6	100	Sept.	5	-19	Feb.	9	2	27.32	3.31	July	1.37	Apr.	22.4	83	196	70	99	w.
Peru	Miami.	726	6	50.5	96	Sept.	5, 7	-20	Feb.	9, 10	6	31.77	4.52	May	0.66	Aug.	76.5	114	95	190	80	sw.
South Bend.	St. Joseph	864	4	49.4	92	June	5	-21	Feb.	9, 12	4	38.05	5.42	May	1.89	Aug.	73.6	118	199	64	102	s.
Syracuse	Kosciusko. . . . .	. . .	4	48.7	92	Sept.	5	-17	Feb.	9, 12	4	28.25	4.66	May	0.52	Apr.	33.0	78	143	145	77	sw.
Topeka	Lagrange	737	7	49.3	100	Sept.	5	-20	Feb.	9	7	18.10	3.80	May	T.	Aug.	24.5	32	208	109	48	nw.
Valparaiso	Porter	716	2	. . .	97	Sept.	2, 3	. .	. . . . .	. . . . .	2	. . .	5.05	May	0.57	Aug.	. . .	. .	. .	. .	. .	. .
Winamac.	Pulaski . . . . .	. . .	16	50.8	103	Sept.	5	-22	Feb.	9	16	31.18	3.98	May	0.75	Apr.	40.3	97	136	123	106	sw.
Mean . . . . .	. . . . .	. . .	18	52.7	106	Sept.	6, 7	-29	Feb.	13	18	35.05	4.46	Mch.	1.60	Apr.	28.5	97	147	107	111	sw.
State. . . . .	. . . . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .	. . .

† Also in other months, on other days, or in other directions.

NOTE.—All records are used in determining State or district temperature means and average or total precipitation, but State and district departures are determined by comparison of current data of only such stations as have normals.

C. F. R. WAPPENHANS,
Local Forecast Official and Section Director, Indianapolis, Ind.

PURDUE UNIVERSITY.

TWELFTH ANNUAL REPORT

OF THE

Agricultural Experiment Station

LAFAYETTE, INDIANA.

FOR THE YEAR ENDING JUNE 30, 1899.

BOARD OF CONTROL

*Charles B. Stuart, President.....Lafayette, Tippecanoe County.
William V. Stuart.....Lafayette, Tippecanoe County.
William A. Banks.....Laporte, Laporte County.
Sylvester JohnsonIrvington, Marion County.
David E. Beem.....Spencer, Owen County.
Job H. Van Natta.....Lafayette, Tippecanoe County.
Benjamin HarrisonIndianapolis, Marion County.
William H. O'Brien.....Lawrenceburg, Dearborn County.
James M. Barrett.....Fort Wayne, Allen County.
John MartinBrookville, Franklin County.

JAMES H. SMART, LL. D.,
President of the University.

EDWARD A. ELLSWORTH,
Secretary.

JAMES M. FOWLER,
Treasurer.

STATION STAFF.

Charles S. Plumb, B. S.....Director.
William C. Latta, M. S.....Agriculturist.
James Troop, M. S.....Horticulturist.
Henry A. Huston, A. M., A. C.....Chemist.
Joseph C. Arthur, D. Sc.....Botanist.
Arvill W. Bitting, D. V. M.....Veterinarian.
William Stuart, M. S.....Assistant Botanist.
**William B. Anderson, B. S.....Assistant Agriculturist.
James Harrison Skinner, B. S.....Assistant Agriculturist.
A. Hugh Bryan, B. S.....Assistant Chemist.
H. E. Van Norman, B. S.....Farm Superintendent and Assistant.

*Died February 20, 1899. ** Resigned March 20, 1899.

TWELFTH ANNUAL REPORT

OF THE

Purdue University Agricultural Experiment Station.

REPORT OF THE DIRECTOR.

To President James H. Smart:

Sir—The following report is for the year ending June 30, 1899, and is the first annual report of this Station covering the year ending June 30, instead of the regular calendar year, as heretofore. This change has been made at the request of the United States Department of Agriculture, in order that the report might be published at an early enough date to enable department officials to use it along with those of other stations in making up reports for Congress on station administration.

This report also differs from its predecessors in containing comprehensive reports on experiments from the different departments of the Station, instead of consisting of brief reports of work in progress, as has heretofore been the case. The policy now being adopted is to publish bulletins of rather limited length from time to time, and use the annual report as a medium for publishing, more fully than heretofore, the results of research work. This plan will greatly enlarge the annual report, but it is believed will also add materially to its value to the farmers of the State. Heretofore, but 500 of 1,000 copies of the report have been printed, and these distributed to experiment stations and applicants. I now suggest that at least 5,000 copies of this report be printed, so that copies may be distributed to such farmers as may apply for them.

The experimental work for the year has progressed uniformly and smoothly. The sugar beet investigations have continued as heretofore, and over 1,200 pounds of seed supplied by the United States Department

of Agriculture have been distributed to 550 farmers in this State. Although the sugar beet investigations of the Station now date back for over ten years, still much interest is shown in the work by the people. This season, in addition to the regular testing work, experiments have been undertaken to show the effects of different artificial plant foods on sugar production in the root.

The investigations of the Station on surface versus sub-irrigation have attracted considerable attention, especially as relates to lettuce culture. A number of different kinds of plants, however, are receiving the attention of the botanical department in this connection, and more information on the subject is printed elsewhere in this report.

Some years ago investigations were undertaken by the chemical department on the composition of edible fungi, while the botanical department investigated the botanical side of the subject, and latterly the cultural phase of it. At the present time a small mushroom house is in operation, in which last year a crop of about 100 pounds of mushrooms was harvested. This work now in hand and contemplated promises most interesting results from an economic standpoint.

No extended investigation work has been conducted during the year in the veterinary department, owing to the absence on leave for a considerable part of this time of Dr. Bitting, Station Veterinarian, who has been pursuing special studies at Indianapolis.

The general work of the Station has continued along essentially the same lines as during the past few years, no changes of importance having taken place.

The Station staff has undergone but slight change during the year, and this only in the resignation of Mr. W. B. Anderson, the Assistant Agriculturist, who retired to his farm in the southern part of the State. Mr. J. H. Skinner, B. S., a graduate of the School of Agriculture at Purdue, has become Mr. Anderson's successor.

Improvements of a much needed character have been effected on the farm this year. The erection of a new piggery for experimental feeding, which was completed in June, was the most important improvement in the working equipment on the farm that has thus far taken place in years. We now have a modern two-story pig feeding building, constructed with a view to securing the most sanitary arrangements, and a structure that will greatly facilitate the care and feeding of our swine. This building is illustrated and described elsewhere in this report.

The basement of the horse barn has been remodeled, and a number of commodious box stalls constructed in place of the old-fashioned open stalls on the north side of the basement. A new harness room has also been built, and the stairway leading to the floor above has been changed to a more suitable location against the west side of the basement, thereby economizing room.

Another important improvement was made in building an addition to

the west side of the tool house. This is fifty-six feet long and eighteen feet wide, and is so constructed that the entire west side consists of a series of large doors hung with rollers on two tracks. At any point on the side of the building tools can be taken in or out by simply pushing a door to one side. This system is an admirable one, and is such as may be adopted to advantage by visitors to the Station seeking for improved methods of housing tools.

Publications have been issued as follows during the past year:

PAMPHLET BULLETINS.

Bulletin No. 72, Vol. IX, August, 1898, pp. 67-76. Field experiments with wheat. By W. C. Latta and W. B. Anderson.

Bulletin No. 73, Vol. IX, October, 1898, pp. 77-92, figs. 17-19. Tests of strawberries, raspberries, blackberries and grapes. By James Troop.

Bulletin No. 74, Vol. IX, November, 1899, pp. 93-100, fig. 20, plates VI. A native white bedding plant. By J. C. Arthur.

Bulletin No. 75, Vol. X, January, 1899, pp. 20, fig. 1. The sugar beet in Indiana in 1898. By H. A. Huston and A. H. Bryan.

Bulletin No. 76, Vol. X, March, 1899, pp. 21-28. Skim milk as a food for young growing chickens. By W. B. Anderson.

Bulletin No. 77, Vol. X, March, 1899, pp. 29-44. Field experiments with corn. By W. C. Latta and W. B. Anderson; Mangel-wurzels and the cost of production. By H. E. Van Norman; Formalin for grain and potatoes. By J. C. Arthur.

Bulletin No. 78, Vol. X, May, 1899, pp. 45-52, figs. 2-4. The San Jose scale and other scale insects, and the Indiana nursery inspection law. By James Troop.

NEWSPAPER BULLETINS.

No. 62, July 12, 1898. Scab in heads of wheat. By J. C. Arthur, Botanist.

No. 63, July 28, 1898. Varieties of winter wheat. By W. C. Latta, Agriculturist.

No. 64, August 5, 1898. Contagious sore eyes among cattle. By A. W. Bitting, Veterinarian.

No. 65, August 6, 1898. Loose smut of wheat. By William Stuart, Assistant Botanist.

No. 66, August 10, 1898. Disinfecting pens at fairs. By A. W. Bitting, Veterinarian.

No. 67, August 26, 1898. Sugar beets; Prevention of leaf injury—Harvesting. By H. A. Huston, Chemist.

No. 67, September 26, 1898. Sore mouth among cattle. By A. W. Bitting Veterinarian.

No. 68, October 3, 1898. The grain weevil. By James Troop, Horticulturist.

No. 69, November 2, 1898. Bacterial rot of cabbage. By William Stuart, Assistant Botanist.

No. 70, December 10, 1898. The cost of creamery buildings and outfits. By C. S. Plumb, Director.

No. 71, January 3, 1899. Live stock diseases in Indiana during 1898. By A. W. Bitting, Veterinarian.

No. 72, March 25, 1899. Sugar beet seed. By H. A. Huston, Chemist.

No. 73, April 19, 1899. The soy bean as a farm crop. By W. C. Latta, Agriculturist.

No. 74. May 13, 1899. Points concerning the nursery inspection law. By James Troop, Horticulturist.

No. 75, May 31, 1899. Black leg or black quarter. By A. W. Bitting, Veterinarian.

No. 76, June 24, 1899. The use of cyclone churns. By C. S. Plumb, Director.

The demand for the Station bulletins has become very great. The following table gives the number of copies of each report and bulletin published, number of pages per copy and total pages per edition:

<i>No. of Publication.</i>	<i>No. Copies Printed.</i>	<i>Pages in One Copy.</i>	<i>Total Pages in Entire Edition.</i>
10th report.	500	67	33,500
11th report.	500	22	11,000
Bulletin 72.	17,000	10	170,000
Bulletin 73.	16,000	16	256,000
Bulletin 74.	16,000	8	128,000
Bulletin 75.	16,000	20	320,000
Bulletin 76.	18,000	8	144,000
Bulletin 77.	18,000	16	288,000
Bulletin 78.	18,000	8	144,000
16 newspaper bulletins . .	11,200	1	11,200
Total	131,200		1,505,700

This table shows that the Station published over a million and a half pages of reading matter during the past year. The extent to which much of this was read is not easy to comprehend. The newspaper bulletins are mailed to 650 different periodicals, in which they are extensively published so that it can readily be seen that they are brought to the attention of millions of readers in the central West. These with the 130,000 copies of the pamphlet bulletins, provide a wide distribution of Station literature over a wide territory.

STATION MAILING LIST.

How extensively the bulletins are circulated may be seen from the following statement of the nature of our mailing list, which on June 30 comprised 16,512 names. This table shows the growth of the list from 1893 to June 30, 1899:

NUMBER OF NAMES ON LIST OF	Jan. 18, 1893.	Jan. 4, 1894.	Jan. 10, 1895.	Jan. 1, 1896.	Jan. 1, 1897.	Jan. 1, 1898.	J'ne 30, 1899.
People in Indiana.	5,741	7,131	8,666	9,143	10,590	11,900	13,458
Indiana periodicals	635	668	653	625	660	650	636
People in other States.	1,158	1,316	1,606	1,788	1,872	2,000	2,200
Periodicals in other States	83	91	85	92	76	80	96
Foreigners.	26	51	61	77	91	105	112
Foreign periodicals	7	7	7	6	8	8	10
Total.	7,650	9,264	11,079	11,731	13,297	14,750	16,512

I herewith submit, as a part of the annual report of the Station, a series of contributions from the different departments reporting upon the work in progress or completed.

Respectfully submitted,

C. S. PLUMB,
Director.

ROSE GROWING WITH CHEMICAL FERTILIZERS.

WILLIAM STUART.

At the present time the importance of the rose growing industry can hardly be estimated. The winter forcing of roses in America alone has assumed such proportions and represents such an outlay of capital, that any knowledge conducive to a better understanding of the food requirements of the plants gives to the industry an additional value.

A frequent complaint made from time to time by rose growers¹ is that injurious effects result from the use of acidulated bone meal when applied to the soil in the rose bench. According to these complaints injury may result from an application to the soil previous to setting the plants or from a surface dressing afterwards. Whether or not the injury is a result of the acidulated bone meal or of some adulterant which it contains is

¹ *Am. Florist*, 6 : 282, 1890 ; 12 : 414, 1896. *Florists' Exchange*, 8 : 981, 1896 ; 9 : 73, 1897.

not definitely known. Chemists affirm that acid dissolved bone meal rarely if ever contains any appreciable amount of free acid, certainly never in sufficient amounts to do injury. There is good reason for believing that much of the injury is a result of improper feeding, or cultural attention, rather than of the presence of free acid in the bone meal. Such a quality of bone meal was used in connection with the other tests upon roses, and the results are given in the following pages.

In view of the commercial value of the rose and its ever increasing popularity with the masses, as well as the lack of positive knowledge regarding the relative effects of different chemicals upon its growth, it was thought advisable by the botanical department of this Station to undertake some experiments with roses. These experiments, undertaken by the writer, under the supervision of Dr. J. C. Arthur, Station Botanist, were intended to show the relative effects of different forms of phosphoric acid, both separately and conjointly with nitrate of soda and muriate of potash, in the growing of roses.

It is apparent to all that the value of an experiment is increased by the uniformity of the conditions to which all the plants are subjected. The nature of the experiment about to be outlined precluded the possibility of its being conducted according to the methods usually followed by florists, involving as it did so many different combinations of fertilizers. The method adopted, while not in anywise adapted to commercial practice, yet will, I think, show that all plants were accorded the same treatment, and that any variation in the product was due to the fertilizers applied. In the application of the fertilizers to the plants different amounts were used in order to determine how much the plant could most profitably use. The value of the experiment to the florist depends not so much upon the fact that by the use of chemical fertilizers roses can be grown without the aid of barnyard manure, but rather that good results may be obtained if the right fertilizers are used. If it can be determined by these results that more roses can be produced when a particular form of phosphoric acid is used, and that by combining this with some form of nitrogen or potash or both a greater increase may be obtained, then it would seem that at least a step forward has been made toward a better knowledge of the actual food requirements of the rose. If it can be proven that a sufficient amount of phosphoric acid can be added to the soil at the outset to supply the plant's every need for the whole season, then we may save ourselves the labor and expense of frequent applications of that ingredient.

As no suitable greenhouse structure was available for the experiment, it was decided to make use of the vegetation house,² and to conduct the experiments during the summer months.

² The vegetation house is a glass building, especially constructed for conducting experiments during the summer months, having no provision for artificial heating, being intended simply as a protection for the plants during storms.

SELECTION OF PLANTS.

In order to make the comparative results of as much value as possible, it was deemed best to confine our attention to a few varieties. It became necessary then to select such plants as would prove good summer bloomers. The Kaiserin Augusta Victoria and the Perle des Jardins were accordingly decided upon as being well adapted for the purpose. The former is a hybrid tea, introduction of 1891 by Lambert and Reiter. Its parentage, so far as known to the writer, has never been given by its introducers, and is possibly unknown to them. It is recognized as one of the best white summer blooming roses grown. The Perle des Jardins is a yellow tea rose, introduced by N. Levet in 1873,³ and is generally conceded as being one of the best yellow outdoor roses grown.

Plants of the above mentioned varieties from three inch pots were obtained from E. G. Hill, of Richmond, Ind., May 14, 1896. A sufficient number of plants were ordered to permit of some selection.

SOIL.

It is generally conceded that a clayey soil is best adapted to the growth of roses, hence that selected for the experiment was one which contained a good percentage of clay. It was necessary also to select a soil which was reasonably exhausted of plant food, or had never accumulated it, this being secured by the removal of the upper three inches of soil and then taking out to a depth of twelve inches or more. In order to make it all of a uniform character, it was passed through an eighth inch wire mesh screen, and afterwards thoroughly mixed by shoveling it over two or three times.

POTS.

The pots used for growing the roses were of zinc, especially constructed for experimental work. They are water tight and so arranged as to permit of sub-watering. This is accomplished by the side of the pot being perforated with a half inch hole near the bottom. A zinc cup attached to the outer surface of the pot surrounds the hole and thus prevents any loss of water while watering, the water being run into the hole by means of a glass funnel, to which is attached a piece of rubber tubing. To prevent the soil from obstructing the entrance of the water to the pot, an inverted shaped trough of zinc was laid on the bottom of the pot, from the hole to the opposite side. The lower sides of this piece of zinc were notched in order to permit the water to distribute itself rapidly through the surrounding material.

The method of filling the pots was similar to that followed in previous cereal experiments. A weighed quantity of clean, medium coarse gravel was first put in the pots, the gravel being used to afford good drainage

³ Gard. Chronicle 5, new series, p. 755, 1876.

as well as to facilitate the distribution of the water. It was then filled with a weighed quantity of soil. The pots were then placed on iron bases resting on movable trucks. These bases are raised by means of short legs, about three-fourths of an inch above the surface of the truck. An outer cylinder of tin having a diameter of about one and one-half inches greater than that of the pot was then placed over the can, being supported by its lower surface on three projections of the base. In this way a free circulation of air around the pot was obtained, as well as protection of the pot from the direct rays of the sun.

FERTILIZERS.

The fertilizers were applied to the soil in the cans, previous to setting the plants therein, and were thoroughly incorporated with it. The kinds of fertilizers used were as follows: Dissolved bone black, rock phosphate, raw bone meal, acidulated ground bone, superphosphate, nitrate of soda and muriate of potash. The amounts applied to each plant were, in the case of the nitrate of soda and muriate of potash, in part based on some previous work on cereals, while that of the phosphoric acid was based on the assumption that one-half gram of phosphoric acid was sufficient for each 100 grams of water free substance of the plant, a plant being assumed to produce on an average 290 grams of water free substance. Only the available phosphoric acid was taken into account in the computations.

Purdue Univ. Agric. Exp. Station.

Plate I.



A.



B.

A.—Comparison of different forms of phosphates on roses :

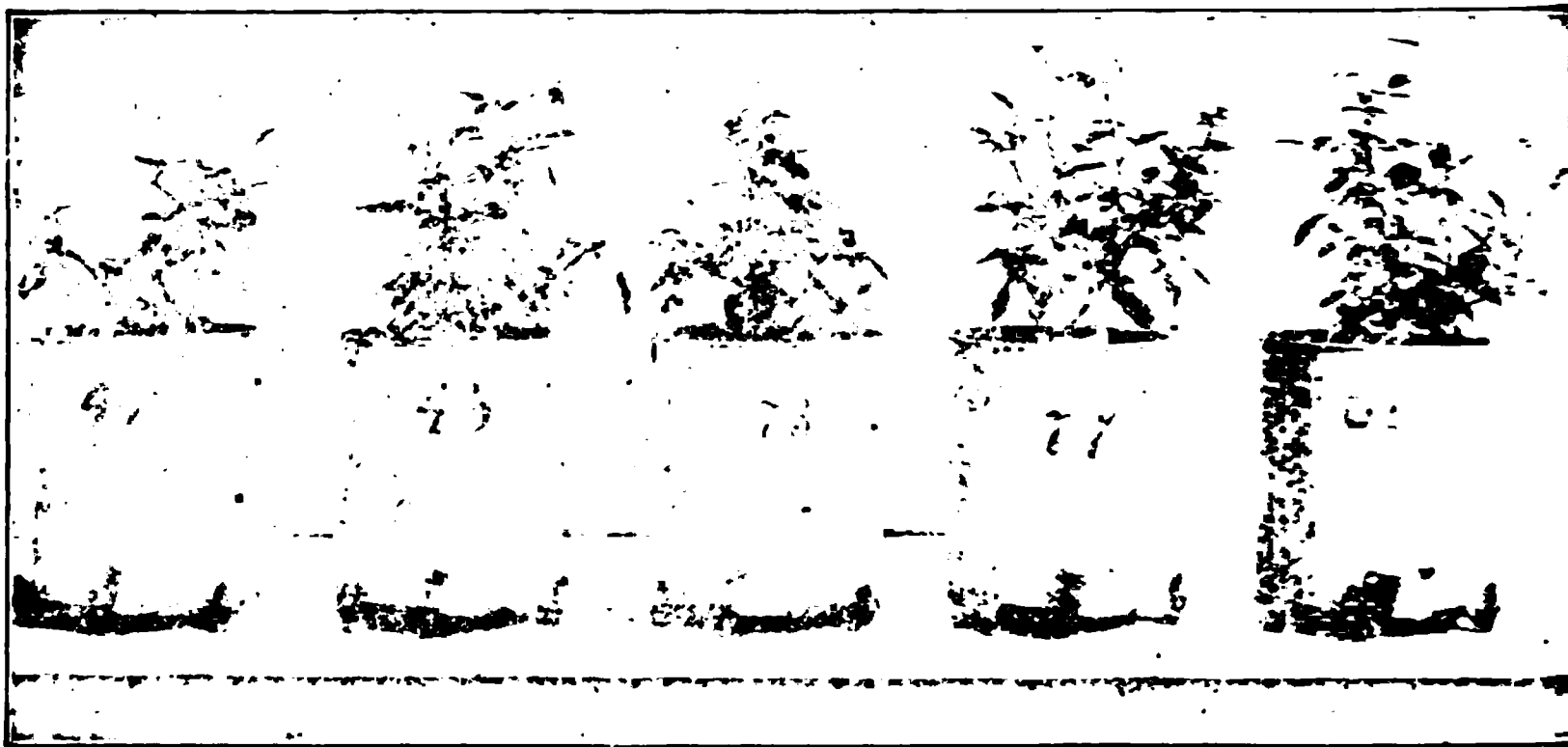
1. Without fertilizer (control plant).
6. Medium amount of dissolved bone black.
25. Medium amount of rock phosphate.
45. Medium amount of raw bone meal.
89. Medium amount of superphosphate.

B.—Comparison of different amounts of raw bone meal :

42. Without fertilizer (control plant).
43. Minimum amount of raw bone meal.
45. Medium amount of raw bone meal.
48. Maximum amount of raw bone meal.

Purdue Univ. Agric. Exp. Station.

Plate II



A.



B.

A.—Comparison of nitrogen and potash with raw bone meal on roses :

- 42. Without fertilizer (control plant).
- 45. Medium amount of raw bonemeal.
- 73. Medium amounts of raw bone meal and nitrate of soda.
- 77. Medium amounts of raw bone meal and muriate of potash.
- 81. Medium amounts of raw bone meal, nitrate of soda and muriate of potash.

B.—Comparison of clay and black loam soils :

- | | | |
|-------|---|--|
| Clay | { | 136. Without fertilizer (control plant). |
| | | 109. Medium amounts of dissolved bone black and muriate of potash. |
| Black | { | 61. Without fertilizer (control plant). |
| Loam | { | 128. Medium amounts of dissolved bone black and muriate of potash. |

The available amounts of phosphoric acid as shown by analysis, in the ingredients used, are as follows:

Dissolved bone black =16 % phosphoric acid, 0.60% nitrogen.
Rock phosphate =12.74% phosphoric acid.
Raw bonemeal = 5.31% phosphoric acid, 4.27% nitrogen.
Acidulated ground bone = 7.91% phosphoric acid, 2.28% nitrogen, 1.62% potash.
Superphosphate =14.22% phosphoric acid.
* The writer is indebted to Mr. W. J. Jones, Assistant State Chemist, for the analysis of the acidulated ground bone.

In addition to the phosphoric acid, nitrogen and potash already given for the acidulated ground bone, tests for chlorides and sulfates were obtained. The amount of chlorine present was largely in excess of that required for the potash contained, the excess being equal to over 166 pounds, or an amount equal to 274 pounds of salt per ton.

It is apparent from the above results that the acidulated ground bone was greatly adulterated with common salt. The manufacturers of this ground bone are unfortunately not known to the writer, the sample having been obtained from a Lafayette florist, who in turn had purchased it from a dealer in florists' supplies in Cincinnati, Ohio.

GROUPING OF FERTILIZERS.

As the number of zinc pots of the smaller size was limited to 80, and the available ones of the next size larger to forty-two, it became necessary to so group the plants and fertilizers as to permit of as many duplicate series as safety would permit.

The Kaiserin roses being deemed best adapted to the work intended, they were planted in the smaller pots. This gave eighty plants, which were divided into four groups of twenty each, and numbered from I to IV. The surface area of the smaller pots was approximately 48.7 inches and of the size larger 75.6 inches.

Each group contained a different form of phosphoric acid, and was so arranged as to be in exact duplicate, in so far as the available phosphoric acid was concerned. In tables I to IV are presented groups I to IV, giving the kinds and amounts of fertilizers applied, together with the actual amounts contained in each ingredient.

TABLE I.—GROUP I.—KIND OF FERTILIZER AND AMOUNT APPLIED.

NO. OF PLANT.	Dis. Bone Black, in Grams.	Muriate of Potash, in Grams.	Nitrate of Soda, in Grams.	RATE PER SQUARE YARD IN OUNCES.		
				Dis. Bone Black.	Muriate of Potash.	Nitrate of Soda.
1, 2 . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
3, 4 . . . .	. . . . .545	. . . . .	. . . . .	. . . . .51	. . . . .	. . . . .
5, 6 . . . .	. . . . .2.728	. . . . .	. . . . .	. . . . .2.6	. . . . .	. . . . .
7, 8 . . . .	. . . . .13.640	. . . . .	. . . . .	. . . . .12.8	. . . . .	. . . . .
9, 10 . . . .	. . . . .2.728	. . . . .	. . . . .3.145	. . . . .	. . . . .	. . . . .2.95
11, 12 . . . .	. . . . .2.728	. . . . .	. . . . .6.290	. . . . .	. . . . .	. . . . .5.90
13, 14 . . . .	. . . . .2.728	. . . . .4.194	. . . . .	. . . . .	. . . . .3.93	. . . . .
15, 16 . . . .	. . . . .2.728	. . . . .8.387	. . . . .	. . . . .	. . . . .7.87	. . . . .
17, 18 . . . .	. . . . .2.728	. . . . .4.194	. . . . .3.145	. . . . .	. . . . .	. . . . .
19, 20 . . . .	. . . . .13.640	. . . . .8.387	. . . . .6.290	. . . . .	. . . . .	. . . . .

TABLE II.—GROUP II.—KIND OF FERTILIZER AND AMOUNT APPLIED.

No. OF PLANT.	Rock Phosphate, in Grams.	Muriate of Potash, in Grams.	Nitrate of Soda, in Grams.	RATE PER SQUARE YARD IN OUNCES.		
				Rock Phosphate.	Muriate of Potash.	Nitrate of Soda.
21, 22 . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
23, 24 . . .	.685	. . . . .	. . . . .	.64	. . . . .	. . . . .
25, 26 . . .	3.426	. . . . .	. . . . .	3.22	. . . . .	. . . . .
27, 28 . . .	17.130	. . . . .	. . . . .	16.10	. . . . .	. . . . .
29, 30 . . .	3.426	. . . . .	3.145	. . . . .	. . . . .	2.95
31, 32 . . .	3.426	. . . . .	6.290	. . . . .	. . . . .	5.90
33, 34 . . .	3.426	4.194	. . . . .	. . . . .	3.93	. . . . .
35, 36 . . .	3.426	8.387	. . . . .	. . . . .	7.87	. . . . .
37, 38 . . .	3.426	4.194	3.145	. . . . .	. . . . .	. . . . .
39, 40 . . .	17.130	8.387	6.290	. . . . .	. . . . .	. . . . .

TABLE III.—GROUP III.—KIND OF FERTILIZER AND AMOUNT APPLIED.

NUMBER OF PLANT.	Raw Bone Meal, in Grams.	Muriate of Potash, in Grams.	Nitrate of Soda, in Grams.	RATE PER SQUARE YARD IN OUNCES.		
				Raw Bone Meal.	Muriate of Potash.	Nitrate of Soda.
41, 42 . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
43, 44 . . .	1.643	. . . . .	. . . . .	1.54	. . . . .	. . . . .
45, 46 . . .	8.219	. . . . .	. . . . .	7.71	. . . . .	. . . . .
47, 48 . . .	41.095	. . . . .	. . . . .	38.55	. . . . .	. . . . .
73, 74 . . .	8.219	. . . . .	3.145	. . . . .	. . . . .	2.95
75, 76 . . .	8.219	. . . . .	6.290	. . . . .	. . . . .	5.90
77, 78 . . .	8.219	4.194	. . . . .	. . . . .	3.93	. . . . .
79, 80 . . .	8.219	8.387	. . . . .	. . . . .	7.87	. . . . .
81, 82 . . .	8.219	4.194	3.145	. . . . .	. . . . .	. . . . .
83, 84 . . .	41.095	8.387	6.290	. . . . .	. . . . .	. . . . .

TABLE IV.—GROUP IV.—KIND OF FERTILIZER AND AMOUNT APPLIED.

NUMBER OF PLANT.	Superphosphate, in Grams.	Muriate of Potash, in Grams.	Nitrate of Soda, in Grams.	RATE PER SQUARE YARD IN OUNCES.		
				Super-phosphate.	Muriate of Potash.	Nitrate of Soda.
85, 86 . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
87, 88 . . .	.613	. . . . .	. . . . .	.58	. . . . .	. . . . .
89, 90 . . .	3.068	. . . . .	. . . . .	2.88	. . . . .	. . . . .
91, 92 . . .	15.340	. . . . .	. . . . .	14.40	. . . . .	. . . . .
144, 145 . . .	3.068	. . . . .	3.145	. . . . .	. . . . .	2.95
146, 147 . . .	3.068	. . . . .	6.290	. . . . .	. . . . .	5.90
148, 149 . . .	3.068	4.194	. . . . .	. . . . .	3.93	. . . . .
150, 151 . . .	3.068	8.387	. . . . .	. . . . .	7.87	. . . . .
152, 153 . . .	3.068	4.194	3.145	. . . . .	. . . . .	. . . . .
154, 155 . . .	15.340	8.387	6.290	. . . . .	. . . . .	. . . . .

The muriate of potash used contained 53 per cent. of potash, while the nitrate of soda contained 16 per cent. of nitrogen.

In making the original computations, no allowance was made for the nitrogen in the dissolved bone black and raw bone meal, hence groups I and III are unfortunately not exact duplicates of II and IV, in so far as their nitrogen supply is concerned.

The arrangements of the Perle des Jardins was somewhat different from that of the Kaiserin. In the first place, the pots in which they were grown were considerably larger, consequently more soil was used in filling them; twenty-five instead of fifteen pounds being used. In every other respect the work was performed in the same manner as with the former plants. Like them they were divided into four groups, of which the first, or Group V, was an exact duplicate of Group I, at least in so far as the chemical fertilizers are concerned. Group VI contained twelve plants, of which all received dissolved bone black in varying amounts, and half of them an occasional watering with liquid manure. Group VII included four plants, having for their phosphoric acid supply some acidulated ground bone, which the writer obtained from a florist, who said that it had proved injurious to his roses. In Group VIII, which included six plants, a black loam from the garden was used in filling four of the pots, instead of the clay soil; the remaining two pots being filled with a potting soil, consisting of rotted sods, to which had been added one-fifth its bulk of rotted manure. The actual amounts of fertilizers applied to the different groups just mentioned are presented in Tables V-VII. As that of Group V is an exact duplicate of I, it is omitted in the present set of tables.

TABLE V.—GROUP VI.—KIND OF FERTILIZER AND AMOUNT APPLIED.
RATE PER SQUARE YARD IN OUNCES.

NUMBER OF PLANT.	Dissolved Bone Black, in Grams.	Muriate of Potash, in Grams.	Nitrate of Soda, in Grams.	Liquid Manure.	Dissolved Bone Black.
118, 119	2.728	None.	None.	None.	1.65
162, 127	2.728	None.	None.	L. manure.	1.65
129, 130	6.820	None.	None.	None.	4.12
131, 132	6.820	None.	None.	L. manure.	4.12
134, 137	13.640	None.	None.	None.	8.24
138, 139	13.640	None.	None.	L. manure.	8.24

The application of the same relative amount of available phosphoric acid, together with the same amount of potash and with the exception of the nitrogen contained in the phosphoric acid supply of I and III, of nitrogen in each of the first four groups, afforded an opportunity for a comparative study of the effects of different forms of phosphoric acid upon the growth of the plants and the production of flowers.

The pots containing the plants being on movable wooden trucks, were run in under shelter every night and during storms; at other times they were in the open air. All water was supplied the plants from below.

TABLE VI.—GROUP VII.—KIND OF FERTILIZER AND AMOUNT APPLIED.

No. of Plant.	Acidulated Ground Bone in Grams.	Muriate of Potash in Grams.	Nitrate of Soda in Grams.	Rate per Square Yard per Ounce.		
				Acidulated Ground Bone.	Muriate Potash.	Nitrate Soda.
140, 141 . .	6.820	4.194	None.	4.12	3.93	.....
142, 143 . .	13.640	4.194	None.	8.24	3.93	.....

TABLE VII.—GROUP VIII.

No. of Plant.	Dissolved Bone Black in Grams.	Muriate of Potash in Grams.	Kind of Soil.	Rate per Sq. Yd. in Oz.	
				Dissolved Bone Black.	Muriate of Potash.
61, 108 . . . .	.....	.....	Black loam.	.....	.....
111, 128	2.728	4.194	Black loam.	1.65	3.93
133, 135 . . . .	.....	.....	Potting soil.	.....	.....

Throughout the experiment a careful record was kept of the number of blooms cut from each plant. This included the quality of the rose, the number of nodes removed, the length of the stem, color of foliage, etc. Each flower stem was cut back to about two eyes in order to place all under the same conditions. At the close of the season of 1896, a series of photographs were taken in order to show what effect the several fertilizers had upon the growth of the plants. Plate I-A shows a plant from each of the four groups receiving a medium supply of phosphoric acid, together with a plant which had not received any. Plant I represents the control plant, 6 dissolved bone black, 25 rock phosphate, 45 raw bone meal, 89 superphosphate. Apparently, 89 is the largest plant, with 6 a very close second, and 45, 25 and 1 following in the order mentioned.

In Plate I-B are shown four plants from Group III, in which are contrasted plants receiving minimum, medium and maximum amounts of phosphoric acid, with plant 42, which did not receive any. A cursory

glance at the plate will show at once that the development of the plants has been in accordance with the amount of fertilizers applied.

In order to compare the effects of nitrate of soda and muriate of potash when used separately, as well as conjointly, in connection with phosphoric acid as against phosphoric acid alone, and one without fertilizers, a third photograph was taken (Plate II-A). It will be observed that all except forty-two received medium amounts of the fertilizers. There seems to be very little difference between 77 and 81, the former of which received raw bone meal and muriate of potash, while the latter received nitrate of soda in addition to these two. A similar state of affairs seems to exist between 45 and 73, to the first of which raw bone meal was applied, while the latter received raw bone meal and nitrate of soda.

Having considered some of the effects of different chemical combinations on the growth of the Kaiserin roses, it is but fitting that a few of the Perles should be represented, in order to compare the relative growths made by the two varieties under identically the same conditions. In plate II-B, we have a plant each in clay and black loam, also one each of plants receiving dissolved bone black and muriate of potash. Nos. 136 and 61 represent the clay and black loam soils, respectively, while 109 and 128 are those having the above mentioned fertilizers, 109 being in clay. In this case there is no difficulty in discerning the difference in the size of the plants. In each instance those grown in the black loam are much larger and sturdier plants. A comparison of plant 136 with that of 1, in Plate I, which are comparable plants, shows a noticeable difference in favor of the latter. With few exceptions, this difference was noticeable throughout the series of experiments. As has been noted in Plate IV, the growth of the plants in the black loam was much superior to those in clay soil, when grown under exactly the same conditions. Both soils were considered deficient in plant food, hence there could have been but little influence exerted in this direction. In only one respect did the treatment accorded the plants vary from that usually given; this was in the application of water. Possibly sub-watering gives better results on light than on heavy soils, on account of its less retentive qualities, thereby permitting a freer movement of water through the soil.

WINTERING PLANTS.

Being desirous of continuing the experiment another season, it became necessary, in the absence of any artificial heat in the "Vegetation House," as well as facilities for proper ventilation, to provide some means by which the plants could be carried through the winter without injury from heat or frost. A cheap and efficient means of accomplishing this end, was effected in the construction of a pit in which some unused hot-bed sashes were made to do service as a portion of the roof. In the con-

struction of the pit, comparatively little excavating was done, only about 18 inches being removed from the whole surface, and an additional 18 inches on the south side for a walk. In size it was 9x15 feet, running east and west. The north wall being raised about a foot above the surface of the ground, while the south wall was raised two feet. It was built with a hip roof, the north roof being formed of five hotbed sashes, while that of the south was covered with boards and then banked with straw and earth. The sash was given a north exposure in order that the rays of the sun in the early spring would have little effect on the inside temperature of the pit, thus permitting the plants to be kept dormant much later than could otherwise have been done. An entrance to the pit was made at the east end, opening directly into the walk. The plants were stored in the pit November 25, 1896, having been previously well ripened off.

All the attention given the plants during the winter months consisted in protecting the glass during the severe weather with coarse litter, and admitting light and air whenever possible. No water being given the plants from the time they were placed in the pit till they were pruned. March 29, 1897.

PRUNING.

As soon as the buds began to push out in the spring, the plants were closely pruned, each branch being cut back to two eyes on both the Kaiserin and Perle roses. Many of the plants had retained quite a large number of their old leaves throughout the winter. On April 1st, the plants were removed from the pit to the vegetation house. To avoid introducing any disturbing factors, it was decided, with the exception of Group VIII, not to repot the plants, but to apply the same amount of fertilizers as during the first season, to the surface of the soil, and stir it in as deeply as possible without injuring the newly forming roots. The fertilizers were applied April 2-5. The plants in Group VIII were removed from the pots, the soil shaken off and then repotted in black loam. The following amount of raw bone meal was added:

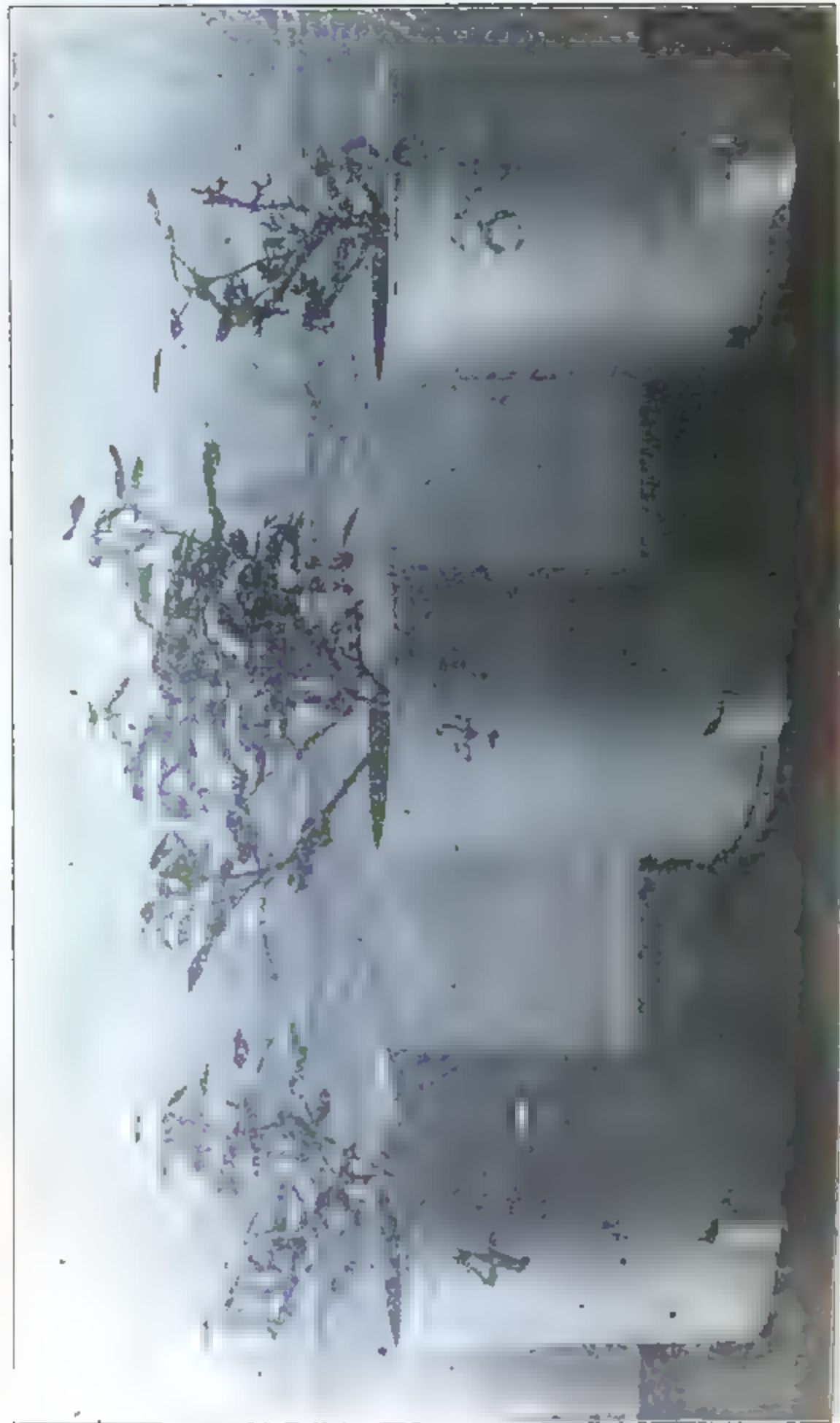
TABLE VIII.—GROUP VIII.—KIND OF FERTILIZER AND AMOUNT APPLIED.

No. of PLANT.	Raw Bone Meal in Grams.	Rate per Square Yard in Ounces.
61, 108 . . . . .	. . . . .	. . . . .
111, 128	41.095	33.55
133, 135	61.643	57.83

INJURY FROM FERTILIZERS.

As the plants began to send out new shoots, it was quite noticeable that those having a large supply of potash or nitrate of soda, or both, started much more slowly, and even in some cases the young leaves were badly burned. With one exception, all recovered from the effects of this injury, though rather slowly. To show that the injury was due to the nitrate of soda and potash, a photograph (see Plate III) of three of the plants was taken May 6, nearly five weeks after the application of the fertilizer, in which a plant (42) having no fertilizer, another (47) having a maximum amount of raw bone meal and the third (84) having a maximum amount of all three ingredients, are represented. The vigorous growth of 47 is in direct contrast to the almost lifeless appearance of 84. Almost without exception, wherever nitrate of soda or muriate of potash had been applied in large amounts, more or less injury resulted to the plants. This was what might naturally be expected from the nitrate of soda, but in the case of the muriate of potash, it was not supposed that any reasonable amount would be injurious. Less injury from the fertilizers was noted the first season than in that of the second. This was probably due to the fact that the fertilizers were more evenly distributed throughout the soil during the former year. Though as a rule the nitrate of soda caused the most injury to the plants, immediately after its application, the injurious effects did not seem to be so permanent as that of the muriate of potash, as will be seen when the product of the plants are compared with each other.

Although it was not intended to continue the experiment the third season, yet it was found at the close of the second year's work, that some features of the experiment might be profitably investigated further, notably that of the effect of large amounts of nitrate of soda and muriate of potash, a comparison being also made as to the relative effect of muriate and sulphate of potash.



Injurious effects from excess of nitrogen and potash on roses: 42, with-out-fertilizer (control plant); 47, maximum amount of raw bone meal; 46, maximum amounts of raw bone meal, nitrate of soda and muriate of potash

The roses were wintered under the same conditions as in the preceding winter, and in the spring were again pruned closely, before sending out new shoots. The soil in the pots was found to have become so

Purdue Univ. Agr. Exp. Station.

Plate IV.



Poor.

Medium.

Good.

EXAMPLES OF THE THREE GRADES OF BLOOM.

compacted during the two preceding years, as to preclude any possibility of its being retained longer. The plants were, therefore, repotted in soil of about the same character as that previously used. Previous to this

operation, all of the old soil was removed from the roots of the plants, the soil adhering to the finer roots being washed off with water. Such of the fertilizers as were applied directly to the soil were incorporated with it previous to filling the can. Only the Kaiserin roses were used in the continuation of the work.

Some very decided changes were made in the grouping of the plants. Instead of having two plants in each combination, double that number were used. By using a larger number, the resulting effects of individual or accidental variation of the plants were greatly lessened. The kinds and amounts of fertilizers used are given in table IX. The same amount of available potash was used as in the preceding years, the only change being that a chemically pure article instead of the commercial one was used. The same change was also made with the nitrate of soda.

In order to make a more extended comparison of the relative values of clay and black loam as a rose soil, a few plants were potted in black loam.

PRODUCT OF THE PLANT.

In considering the results obtained from the data on the number and quality of flowers produced by each plant, an attempt will be made to present tables in which different combinations of fertilizers are so arranged as to enable the reader to make a comparative study of their relative merits without much difficulty.

The roses were classified when cut as good, medium, or poor (see Plate IV), and upon this classification the value of the product from each plant was based. Values were assigned to each class or grade of roses as follows—good roses were valued as 1, medium at .7 and poor at .3. Such valuations were of course more or less arbitrary ones, but nevertheless it permitted of a closer and more uniform comparison of the total product. Taking them in their natural sequence, the Kaiserin plants are the first to be discussed. A table (X) has been prepared in which the separate results of the three seasons for each group are presented, as well as that of the third season.

TABLE IX.—KIND AND AMOUNT OF FERTILIZERS APPLIED.

NUMBER OF PLANT.	Raw Bone Meal, in Grams.	Muriate of Potash (c. p.) in Grams.	Sulphate of Potash (c. p.) in Grams.	Nitrate of Soda (c. p.) in Grams.	RATE PER SQUARE YARD IN OUNCES.				REMARKS.
					Raw Bone Meal.	Muriate of Potash.	Sulphate of Potash.	Nitrate of Soda.	
1, 2, 21, 22	8.219	7.71	Clay soil.
3, 4, 5, 6	41.095	. . . . .	. . . . .	. . . . .	38.55	. . . . .	. . . . .	. . . . .
7, 8, 9, 10	*41.095	. . . . .	. . . . .	. . . . .	38.55	. . . . .	. . . . .	. . . . .
11, 12, 13, 14	8.219	. . . . .	. . . . .	3.068	. . . . .	. . . . .	. . . . .	2.88
15, 16, 17, 18	8.219	. . . . .	. . . . .	6.136	. . . . .	. . . . .	. . . . .	5.76
19, 20, 23, 24	8.219	. . . . .	. . . . .	+6.136	. . . . .	. . . . .	. . . . .	5.76
25, 26, 27, 28	8.219	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
29, 30, 31, 32	8.219	. . . . .	4.113	. . . . .	. . . . .	3.68	3.86	
33, 34, 35, 36	8.219	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
37, 38, 39, 40	8.219	. . . . .	8.226	. . . . .	. . . . .	7.36	7.72	
43, 44, 45, 46	8.219	*8.226	7.72	*Two applications. †Four applications.
47, 48, 73, 74	8.219	. . . . .	. . . . .	. . . . .	. . . . .	7.36	. . . . .	. . . . .
75, 76, 77, 78	8.219	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
79, 80, 81, 82	8.219	. . . . .	4.113	3.038	. . . . .	. . . . .	. . . . .	. . . . .
83, 81, 86, 87	8.219	. . . . .	. . . . .	3.068	. . . . .	. . . . .	. . . . .	. . . . .
88, 89, 90, 91	41.095	. . . . .	8.226	+6.136	. . . . .	. . . . .	. . . . .	. . . . .
92, 144, 145, 146	41.095	. . . . .	. . . . .	+6.136	. . . . .	. . . . .	. . . . .	. . . . .
41, 42, 85	Black loam.
147, 148, 149	8.219	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
150, 151, 152	41.095	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
153, 154	8.219	. . . . .	. . . . .	+6.136	. . . . .	. . . . .	. . . . .	. . . . .

The average value of the control (unfertilized) plants is considered as the normal product from the soil, and the per cent. of increase or decrease is figured on that basis, assuming such value to be 100.

TABLE X—AVERAGE VALUE OF PRODUCT FROM FERTILIZED AND UNFERTILIZED PLANTS FOR 1896, 1897 AND 1898.

	VALUE OF PRODUCT FOR			PER CENT. OF INCREASE OR DECREASE OVER CONTROL FOR		
	1896.	1897.	1898.	1896.	1897.	1898.
No fertilizer	\$5 94	\$10 09	\$10 50	. . . . .	. . . . .	. . . . .
I. Dissolved bone black .	5 74	10 82	. . . . .	— 3.37	+ 7.23	. . . . .
II. Rock phosphate . . .	5 78	11 04	. . . . .	— 2.69	+ 9.42	. . . . .
III. Raw bone meal . . .	8 96	13 84	14 55	+50.84	+37.17	+38.91
IV. Superphosphate . . .	7 07	12 17	. . . . .	+19.02	+20.61	. . . . .

A marked increase is shown in Groups III and IV, with the gain largely in favor of III, in which raw bone meal was used. Groups I and II show a slight decrease during the first season, with an increase in that of the second. It is not fair to infer, however, that the chemical fertilizers applied to I and II were in themselves harmful to the plants, but rather that the amounts and combinations were not best suited to their needs. If we compare those plants to which some form of phosphoric acid had been added, we again find that they were more or less divergent in their results, indicating that some forms were not adapted to the needs of the plant. The data which is presented in Table XI shows that III and IV gave an increase over the control, while with one exception I and II gave a decrease. As in the preceding table the gain is largely in favor of Group III, amounting to over 51 per cent. the first season, 31 per cent. the second season and 27 per cent. the third. This is a good indication that raw bone meal will in itself produce a marked increase. It is altogether probable that some of this increase is due to the nitrogen content of the bone, which in raw bone meal, as has already been shown, amounts to over 4 per cent.

TABLE XI.—AVERAGE VALUE OF PRODUCT FROM PLANTS RECEIVING PHOSPHORIC ACID ALONE, WITH PERCENTAGE OF INCREASE OR DECREASE OVER CONTROL FOR 1896, 1897 AND 1898.

GROUP.	VALUE OF PRODUCT FOR			PER CENT. OF INCREASE OR DECREASE FOR		
	1896.	1897.	1898.	1896.	1897.	1898.
No fertilizer	\$5 94	\$10 09	\$10 50	. . . . .	. . . . .	. . . . .
I. Dissolved bone black	5 45	10 03	. . . . .	— 8.25	— .50	. . . . .
II. Rock Phosphate	6 55	9 82	. . . . .	+10.27	— 2.68	. . . . .
III. Raw bone meal	9 00	12 22	13 34	+51.52	+31.02	+27.05
IV. Superphosphate	8 25	10 38	. . . . .	+38.89	+ 2.87	. . . . .

In order to study the effects of nitrate of soda and muriate of potash when used in connection with phosphoric acid, separate tables have been prepared for each, in which the average results of the plants in each group are compared with the control. The data obtained from plants receiving nitrate of soda and phosphoric acid will be found in Table XII.

TABLE XII.—AVERAGE VALUE OF PRODUCT FROM PLANTS RECEIVING PHOSPHORIC ACID AND NITRATE OF SODA, WITH PERCENTAGE OF INCREASE OR DECREASE OVER CONTROL FOR 1896, 1897 AND 1898.

GROUP.	VALUE OF PRODUCT FOR			PER CENT. OF INCREASE OR DECREASE FOR		
	1896.	1897.	1898.	1896.	1897.	1898.
No fertilizers	\$5 94	\$10 09	\$10 50	. . . . .	. . . . .	. . . . .
Dissolved bone black and nitrate of soda	7 58	13 23	. . . . .	+27.61	+31.12	. . . . .
Rock phosphate and nitrate of soda	5 50	13 40	. . . . .	— 7.41	+32.80	. . . . .
Raw bone meal and nitrate of soda	9 30	15 80	12 52	+56.57	+56.59	+19.24
Superphosphate and nitrate of soda	7 85	15 68	. . . . .	+32.15	+55.40	. . . . .

It was found that, as a rule, a combination of phosphoric acid and nitrate of soda produced a better crop than did any other used. In only one instance did it result in a lessened product, and that was probably due to some accidental variation rather than to any injury, for in this particular instance no injury from fertilizers was observed. The increase of Groups III and IV was as in the preceding instances, quite a little in excess of the other two, with III showing a slight gain over IV. With the exception mentioned, Groups I and II showed good gains over the control.

In Table XIII is presented the data obtained from plants to which muriate of potash and phosphoric acid had been applied. In each in-

stance, but one, the addition of muriate of potash resulted in a direct loss in the first season, Group III showing a gain.

In the second season Groups III and IV showed an increase, the former being considerably in excess of the latter. A comparison of Group III for the three seasons shows the greatest gain in that of the last season.

TABLE XIII.—AVERAGE VALUE OF PRODUCT FROM PLANTS RECEIVING PHOSPHORIC ACID AND POTASH, WITH PERCENTAGE OF INCREASE OR DECREASE OVER CONTROL FOR 1896, 1897 AND 1898.

GROUP.	VALUE OF PRODUCT FOR			PER CENT. OF INCREASE OR DECREASE FOR		
	1896.	1897.	1898.	1896.	1897.	1898.
No fertilizer	\$5 94	\$10 09	\$10 50	.....	.....	.....
Dissolved bone black and potash	5 50	9 25	.....	— 7.47	—8.33	.....
Rock phosphate and potash	5 90	9 63	.....	— .63	—4.56	.....
Raw bone meal and potash	8 23	12 63	15 22	+38.35	2+5.17	+44.95
Superphosphate and potash	5 23	10 78	.....	—11.95	+6.84	.....

In order to include the different combinations, it is necessary to make one more comparison of the groups so that their several effects may be studied more closely. In this combination will be included plants receiving all three of the elements, phosphoric acid, potash and nitrogen. The average value of the product of these plants is presented in Table XIV.

TABLE XIV.—AVERAGE VALUE OF PRODUCT FROM PLANTS RECEIVING PHOSPHORIC ACID, POTASH AND NITROGEN, WITH PERCENTAGE OF INCREASE OR DECREASE OVER CONTROL FOR 1896, 1897 AND 1898.

GROUP.	VALUE OF PRODUCT FOR			PER CENT. OF INCREASE OR DECREASE FOR		
	1896.	1897.	1898.	1896.	1897.	1898.
No fertilizer	\$5 94	\$10 09	\$10 05	.....	.....	.....
Dissolved bone black, potash and nitrogen	5 05	11 25	.....	+14.98	+11.25	.....
Rock phosphate, potash and nitrogen	4 40	11 85	.....	+25.93	+17.44	.....
Raw bone meal, potash and nitrogen	9 45	14 60	16 90	+59.09	+44.60	+60.65
Superphosphate, potash, and nitrogen	6 60	12 73	.....	+11.11	+26.16	.....

As in some of the preceding tables, a considerable variation in the first season's product is obtained. For example, Groups I and II are considerably inferior to the control plants, the former being about 16 per

cent. and the latter about 26 per cent. less. Groups III and IV on the other hand show a marked increase, the former of about 59 per cent. and the latter 11 per cent. The second year's product, however, showed a marked increase throughout, averaging from 11.5 per cent. to 44.6 per cent., the latter being from the plants in Group III.

With one exception, in the five preceding tables the product from the plants having raw bone meal, gave a marked increase in yield, averaging from 25 to nearly 60 per cent.

Having now considered the results from the group standpoint, it might be interesting as well as helpful to a better understanding of the effects of phosphoric acid, nitrate of soda and muriate of potash, to merge the four groups into one and thus enable the reader to note the general effects of these elements. Table XV contains the average increase from plants receiving phosphoric acid alone, and in combination with nitrate of soda and muriate of potash, separately and conjointly.

TABLE XV.—GROUPS I-IV.—AVERAGE VALUE OF PRODUCTS FROM PLANTS RECEIVING PHOSPHORIC ACID ALONE, AS WELL AS IN COMBINATION WITH NITRATE OF SODA AND POTASH, FOR 1896, '97, '98

FERTILIZERS USED.	VALUE OF PRODUCT FOR			PER CENT. OF INCREASE OR DECREASE FOR		
	1896.	1897.	1898.	1896.	1897.	1898.
No fertilizer	\$5 94	\$10 09	\$10 50			
Phosphoric acid	7 31	10 76	13 34	+23.06	+ 6.64	+27.05
Phosphoric acid and nitrate of soda	7 55	14 57	12 52	+27.10	+44.40	+19.24
Phosphoric acid and muriate of potash. . .	6 22	10 57	15 06	+ 4.88	+ 4.86	+43.43
Phosphoric acid and sulphate of potash . .	. . .	. . .	15 38	. . . .	. . . .	+46.48
Phosphoric acid, sulphate of potash and nitrate of soda. . . . .	. . .	. . .	18 12	. . . .	. . . .	+73.24
Phosphoric acid, muriate of potash and nitrate of soda.	6 25	12 39	15 60	+ 5.22	+22.79	+48.57

With the exception of the third season's results, which in a measure, are not quite comparable with the preceding work, the plants receiving phosphoric acid and nitrate of soda gave the largest yield, while those having phosphoric acid and potash gave the poorest returns. These conditions are, however, reversed for 1898. Here we find that the poorest results were obtained from the phosphoric acid and nitrate of soda series, and that a combination of all three of the fertilizers gave the greatest increase. It must, however, be borne in mind that in this table the product from the raw bone meal series is lessened by the others. Plants receiving sulphate of potash gave better returns than those with muriate of potash, this being especially noticeable where all three ingredients were used.

The presentation of a complete table of the different groups showing

the effects of the varying amounts of fertilizers, may introduce some interesting data for consideration. In this table (XVI) is given the effects of a minimum, medium and maximum amount of phosphoric acid, and in the case of the two latter in combination with nitrate of soda and muriate of potash. As might be expected, numerous apparent contradictions were obtained especially with the medium and maximum amounts of nitrate of soda and muriate of potash. No doubt much of this is due to the individual variation of the plants themselves, for when these are combined, that is those with medium and maximum amounts, as in the preceding tables, many of these variations are eliminated. In general, the plants receiving maximum amount of phosphoric acid gave an increased yield over those receiving lesser amounts.

TABLE XVI.--AVERAGE VALUE OF PRODUCT RECEIVING VARYING AMOUNTS OF PHOSPHORIC ACID, NITRATE OF SODA AND POTASH.

FERTILIZERS USED.			VALUE OF PRODUCT FOR		PER CENT. OF INCREASE OR DECREASE BASED ON CONTROL.	
Dissolved Boneblack.	Nitrate Soda.	Muriate Potash.	1896.	1897.	1896.	1897.
Minimum . . . . .	. . . . .	. . . . .	\$5 95	\$10 09	— 30.98	— 8.82
Medium . . . . .	. . . . .	. . . . .	4 10	9 20	+ .17	— 4.86
Maximum . . . . .	. . . . .	. . . . .	5 95	9 60	+ 6.06	+11.99
Medium	Medium . . . . .	. . . . .	6 30	11 30	+ 36.36	+52.65
Medium	Maximum . . . . .	. . . . .	8 10	15 40	+ 18.69	+ 9.51
Medium . . . . .	. . . . .	Medium	7 05	11 05	+ 15.82	+ 4.86
Medium . . . . .	. . . . .	Maximum	5 00	10 55	+ 1.01	—21.21
Medium	Medium	Medium	6 00	7 95	— 31.92	+26.86
Maximum	Maximum	Maximum	4 05	12 80	— 14.98	— 3.87
Maximum	Maximum	Maximum	5 05	9 70		
Rock phosphate—						
Minimum . . . . .	. . . . .	. . . . .	5 65	9 10	+ 4.88	— 9.81
Medium . . . . .	. . . . .	. . . . .	6 20	10 85	+ 4.38	+ 7.53
Maximum . . . . .	. . . . .	. . . . .	7 80	9 65	+ 31.31	— 4.36
Medium	Medium . . . . .	. . . . .	4 25	13 55	— 28.45	+34.29
Medium	Maximum . . . . .	. . . . .	6 75	13 25	+ 13.64	+31.32
Medium . . . . .	. . . . .	Medium	6 45	10 30	+ 8.59	+ 2.08
Medium . . . . .	. . . . .	Maximum	5 35	8 95	— 9.93	—11.30
Medium	Medium	Medium	5 20	12 45	— 12.46	+23.39
Maximum	Maximum	Maximum	4 40	11 25	— 25.93	+11.50
Raw bonemeal—						
Minimum . . . . .	. . . . .	. . . . .	6 90	12 35	+ 16.16	+22.40
Medium . . . . .	. . . . .	. . . . .	8 45	13 95	+ 42.26	+38.26
Maximum . . . . .	. . . . .	. . . . .	11 65	13 35	+ 96.13	+32.32
Medium	Medium . . . . .	. . . . .	12 10	14 70	+103.70	+45.69
Medium	Maximum . . . . .	. . . . .	6 50	16 90	+ 9.43	+67.49
Medium . . . . .	. . . . .	Medium	9 30	13 10	+ 56.57	+29.83
Medium . . . . .	. . . . .	Maximum	7 15	12 15	— 20.37	+20.42
Medium	Medium	Medium	9 15	16 15	+ 54.04	+61.06
Maximum	Maximum	Maximum	9 45	13 05	+ 59.09	+29.33
Superphosphate—						
Minimum . . . . .	. . . . .	. . . . .	8 65	10 40	+ 45.62	+ 3.07
Medium . . . . .	. . . . .	. . . . .	7 30	10 30	+ 22.89	+ 2.08
Maximum . . . . .	. . . . .	. . . . .	8 80	10 45	+ 48.15	+ 3.57
Medium	Medium . . . . .	. . . . .	8 55	15 20	+ 43.94	+50.64
Medium	Maximum . . . . .	. . . . .	7 15	16 15	+ 20.37	+60.06
Medium . . . . .	. . . . .	Medium	5 20	11 10	— 12.46	+10.01
Medium . . . . .	. . . . .	Maximum	5 25	10 45	— 11.62	+ 3.57
Medium	Medium	Medium	6 10	12 50	+ 2.69	+23.63
Maximum	Maximum	Maximum	6 60	12 95	+ 11.11	+28.34

the same being true of the medium over the minimum. Quite different conditions are found when we compare the nitrate of soda series; here we find that the increase is about as frequent in the case of the lesser as of the greater amounts. In only one instance did the product fall below that of the control plants, judging the muriate of potash from the same standpoint, practically the same results are obtained, but with the choice in favor of the lesser amount. It should be noted, however, that quite frequently the product falls below that of the control, showing that in these instances the fertilizers applied were not beneficial to the plants.

In the preceding table (XVI) no reference has been made to the third season's work, this omission being purposely made in order to present in the succeeding table the results obtained from the use of raw bone meal for the whole period. The data being so arranged as to permit of easy comparison wherever duplicate conditions existed. Perhaps the most valuable feature in this table is that of the decreased product from the application of a large amount of nitrate of soda, when all applied at once. Compared with the product from plants receiving the same amount in four applications, we find that while in the former there is only a gain of a little over 3 per cent., the latter shows a gain of about 36.5 per cent. Another notable increase is found in the case of the two sets of plants receiving maximum amounts of sulphate of potash, those receiving this amount in two applications show a gain of nearly 80 per cent., as against a gain of a little over 8 per cent. for those with one application. In direct contrast to these figures we find that the muriate of potash series only show a slight gain amounting to about 1 per cent. in favor of two applications. While in the case of raw bone meal alone we find a large decrease, thereby showing at least that a sufficiently large amount of phosphoric acid in the form of bone meal may be applied at once to the plants without fear of injury.

The increased yield from plants receiving sulphate of potash as against muriate of potash, is an indication that potash having its source in the former material is better adapted to rose culture. From the limited data at hand, however, the writer does not feel justified in drawing any very decided conclusions therefrom, as different soils might change the results.

In considering the effects of all three fertilizers when used in combination, it is evident from a comparison of the preceding seasons with that of the latter, that there was a decided gain in the successive applications of nitrate of soda as against a full application at the time of setting the plants. This result was not an unexpected one, for the injurious effect of large amounts of nitrate of soda is well known.

TABLE XVII.—RAW BONE MEAL SERIES.—AVERAGE VALUE OF PRODUCT FROM THE DIFFERENT COMBINATIONS OF FERTILIZERS, WITH THE PERCENTAGE OF INCREASE OR DECREASE OVER CONTROL OF 1896, 1897 AND 1898.

Raw Bone Meal.	FERTILIZERS USED.				VALUE OF PRODUCT FOR			PER CENT. OF INCREASE OR DECREASE FOR		
	Nitrate of Soda.	Muriate of Potash.	Sulphate of Potash.		1896.	1897.	1898.	1896.	1897.	1898.
None	None	None	None	None	\$5 94	\$10 09	\$10 50	+16.16	+22.40	..
Minimum amount	None	None	None	None	6 90	12 35	13 95	+42.26	+38.26	+27.14
Medium amount	None	None	None	None	8 45	13 85	15 63	+96.13	+32.32	+48.86
Maximum amount	None	None	None	None	11 65	13 35	11 05	..	..	+5.24
Maximum amount†	None	None	None	None	12 10	14 70	12 40	+103.70	+45.69	+18.09
Medium amount	Medium amount	None	None	None	6 50	16 90	10 83	+9.43	+67.49	+3.14
Medium amount	Maximum amount	None	None	None . . . . .	..	..	14 33	..	..	+36.48
Medium amount	Maximum amount*	Medium amount	None	None	9 30	13 10	13 93	+56.57	+29.83	+32.67
Medium amount	None	Maximum amount	None	None	7 15	12 15	15 58	+20.37	+20.42	+48.38
Medium amount	None	Maximum amount†	None	None . . . . .	..	..	15 68	..	..	+49.33
Medium amount	None	Maximum amount	Medium amount	None . . . . .	..	..	15 88	..	..	+51.24
Medium amount	None	None	Maximum amount	Maximum amount . . . . .	..	..	11 38	..	..	+8.38
Medium amount	None	None	Maximum amount	Maximum amount . . . . .	..	..	18 88	..	..	+79.81
Medium amount	Medium amount	Medium amount	None	None	9 15	16 15	13 90	+51.04	+60.06	+32.38
Medium amount	Maximum amount	Maximum amount	None	None	9 45	13 05	..	+59.09	+29.33	..
Maximum amount	Maximum amount*	Maximum amount	None	None . . . . .	..	..	17 30	..	..	+64.76
Maximum amount	Maximum amount	None	Medium amount	Medium amount . . . . .	..	..	16 48	..	..	+56.96
Maximum amount	Maximum amount†	None	Maximum amount	Maximum amount . . . . .	..	..	19 90	..	..	+89.52

* Four applications, the last three being made in liquid form by sub-watering.

† Two applications, the last one being made in liquid form by sub-watering.

Thus far we have only considered the results obtained from the Kaiserin roses. The reason for so doing lies in the fact that they proved best adapted to the conditions under which they were grown. Although Group V of the Perle roses was an exact duplicate of Group I in so far as the chemical fertilizers were concerned it should be borne in mind that the pots in which they were grown were considerably larger. This together with a different variety does not admit of any very close comparison of results. For the sake of the readier examination, however, a table has been prepared, in which is given the data, obtained from these two groups for both seasons, showing in detail the results obtained from the different chemical combinations. The average product from the unfertilized plants for 1896 shows a light advantage in favor of Group I, and vice versa for the ensuing year. The Perle des Jardins plants receiving phosphoric acid alone gave much larger yield than did the Kaiserin plants. Those having phosphoric acid and nitrogen did not vary to any appreciable extent if the product of both seasons is considered. Plants having phosphoric acid and potash for their food supply gave much better results in Group V for both seasons than in Group I. This was also true for those to which all three ingredients had been applied. From the data presented the Perle roses gave the best results, from the application of fertilizers. The growth of the plants was, however, very much inferior, and, as a rule, the roses were of an inferior quality.

Through an error in the application of the liquid manure to Group VI, the data obtained was discarded.

Only four plants were used in Group VII, these being compared with the control plants used in Group V. Two of these plants received a medium amount of the acidulated ground bone and potash and the remaining two a maximum amount. Contrary to expectations these plants gave a large increase over those of the control, the increase during the first season being greater than that of the second. In both instances the per cent. of increase was greater from the plants receiving the lesser amount of bone-acid bonemeal as precisely the same thing occurred with some of the other forms of phosphoric acid. In Table XIX will be found the average value of the product from these four plants, including that of the control.

TABLE XVIII.—COMPARISON OF THE VALUE OF THE PRODUCT FROM GROUPS I AND V, IN WHICH DISSOLVED BONE-BLACK WAS USED FOR 1896 AND 1897.

FERTILIZERS USED.		GROUP I. Kaiserin Roses.		GROUP V. Perle des Jardins.		GROUP I. Kaiserin Roses.		GROUP V. Perle des Jardins.	
		Value of Product for		Value of Product for		Per Cent. Increase or Decrease, 1896.		Per Cent. Increase or Decrease, 1896.	
		1896.	1897.	1896.	1897.				
Dissolved Boneblack.	Nitrate of Soda.	Muriate of Potash.							Per Cent. Increase or Decrease, 1897.
Minimum .	. . . . .	. . . . .	\$5 94	\$10 09	\$5 80	\$11 15	. . . . .	. . . . .	. . . . .
Minimum .	. . . . .	. . . . .	4 10	9 20	5 95	12 15	—30.98	+ 8.18	+ 9.37
Medium . .	. . . . .	. . . . .	5 95	9 60	7 75	13 50	+ .17	+40.91	+21.08
Maximum . .	. . . . .	. . . . .	6 30	11 30	7 30	13 40	+ 6.06	+32.73	+20.79
Medium . .	Medium . .	. . . . .	8 10	15 40	9 90	13 05	+36.36	+80	+17.04
Medium . .	Maximum .	. . . . .	7 05	11 05	6 05	11 85	+18.60	+10	+ 6.28
Medium . .	. . . . .	Medium . .	5 00	10 55	9 80	13 25	—15.82	+78.18	+18.83
Medium . .	. . . . .	Maximum .	6 00	7 95	6 65	11 05	+ 1.01	+20.91	— .90
Medium . .	Medium . .	Medium . .	4 05	12 80	8 40	11 55	—31.82	+56.36	+ 8.59
Maximum . .	Maximum .	Maximum .	5 05	9 70	5 60	14 20	—14.98	+ 1.82	+27.35

TABLE XIX.—AVERAGE VALUE OF PRODUCT FROM GROUP VII.

ACIDULATED GROUND BONE.	Average Value of Product for 1896.	Average Value of Product for 1897.	Average Per Cent. of Increase or Decrease, 1896.	Average Per Cent. of Increase or Decrease, 1897.
.....	\$5 50	\$11 15	.....	.....
Medium amount	10 05	16 35	+82.73	+46.64
Maximum amount	6 90	15 40	+25.45	+38.12

As has been previously stated it is generally conceded that a clayey soil is best adapted to the growth of roses, hence a comparison of plants grown in such a soil with those grown in one wholly different, should possess some interesting features. As previously mentioned in this report, Group VIII contained plants of the Perle des Jardins rose, part of which were grown in clay soil and part of them in a black loam, in which plants grown in the latter soil were superior to those of the former. In order to secure more data on this point some of the Kaiserin roses were also grown in the black loam during the season of 1898. While the results of the two experiments do not coincide exactly, it has been thought best to present the data and thus give the reader an opportunity to judge for himself in regard to the relative merits.

As has been said, the results of the experiments with black and clay loams in growing Perle des Jardins and Kaiserin roses, do not agree. For example, the unfertilized or control plants show an increase of 60 per cent. in favor of the black loam the first season, and a little over 15 per cent. the second. Comparing these figures with those obtained the third season, we find that instead of having an increase in favor of the black loam plants there is a decrease of 7.62 per cent. or an increase for those in clay loam of over 8 per cent. This seeming discrepancy can not be attributed to the soil or watering, for all received uniform treatment. The only tenable theory by which the contradictory results may be answered, is in the assumption that the black loam is better adapted to the Perle than to the Kaiserin rose, an assumption which is corroborated by actual observation on the growth of these plants, side by side in the same ground outside. Practically the same results were obtained in the use of the chemical fertilizers. The increased yield being noticeably greater with the Perles in the black than in the clay loam and vice versa with the Kaiserin roses. A promising feature of the experiment is the comparatively large increase in rose production from the plants receiving an unusually large amount of raw bone meal. The increase in this case over those receiving a maximum amount was over 24 per cent. The value of this part of the experiment lies not so much in the actual value of the gain, as it does in that it illustrates the fact that large amounts of phos-

TABLE XX.—COMPARISON OF PRODUCT FROM CLAY AND BLACK LOAM SOILS FOR 1896, 1897 AND 1898.

KIND OF SOIL.	KIND OF FERTILIZER USED, IN GRAMS.			AVERAGE VALUE OF PRODUCT.			Per Cent. of Increase or Decrease.
	Dissolved Bone- black.	Raw Bonemeal.	Muriate of Potash.	1896.	1897.	1898.	
Clay loam	None.	None.	None.	\$5 50	\$11 15	\$10 50	+ 60.00
Black loam	None.	None.	None.	8 80	12 85	9 70	+ 78.18
Clay loam	2.728	None.	4.194	9 80	13 25	. . . . .	. . . . .
Clay loam	None.	8.219	None.	. . . . .	. . . . .	13 35	+27.14
Clay loam	None.	41.095	None.	. . . . .	. . . . .	15 63	+48.86
Black loam	None.	8.219	None.	. . . . .	. . . . .	3 43	-67.33
Black loam	None.	41.095	None.	. . . . .	. . . . .	5 60	-46.67
Black loam	2.728	None.	4.194	14 60	. . . . .	. . . . .	. . . . .
Black loam	None.	41.095	None.	. . . . .	19 70	. . . . .	+ 76.68
Black loam	None.	61.643	None.	. . . . .	24 45	. . . . .	+119.28
Potting soil	None.	None.	None.	. . . . .	. . . . .	12 31	. . . . .

phoric acid in the form of rawbone meal, amounts far in excess of the actual requirements of the plants, may be applied to the soil previous to setting the plants, and this too without in any way endangering the vitality of the plants. The amount applied in the case just mentioned, 61.643 grams per pot, is equal to about 2½ pounds per square yard.

The maximum amount of raw bone meal, nitrate of soda and the muriate and sulphate of potash applied to the Kaiserin roses, estimated to the square yard, were approximately as follows:

Raw bone meal.....	41.095 grams	2 lbs. 6 oz. per sq. yd.
Nitrate of soda (com.).....	6.290 grams	6 oz. per sq. yd.
Muriate of potash (com.)..	8.387 grams	8 oz. per sq. yd.
Sulphate of potash (c. p.)..	8.226 grams	8 oz. per sq. yd.
Sulphate of potash (com.)..	9.492 grams	9 oz. per sq. yd.

The raw bone meal used in the experiment was obtained of the Empire Carbon Works, St. Louis, Mo., and is listed by them at \$25 per ton. The other ingredients used were obtained from various sources.

SUMMARY.

There is every reason to believe from the results obtained in the several experiments enumerated that chemical fertilizers when properly used may be made to serve every need of the rose plant so far as food is concerned.

The use of raw bone meal in every instance gave an increased yield over that of the control plants, as well as giving a greater percentage of gain than did those receiving other forms of phosphoric acid.

Pure bone meal is not injurious to rose plants, even when applied in amounts largely in excess of the requirements of the plant.

The acidulated bone meal which has been used by florists and supposed to be harmful did not produce any noticeable injury, even when used in large amounts.

As a rule, a combination of phosphoric acid and nitrate of soda gave better results than one of phosphoric acid and muriate of potash.

Two or three applications of potash during the season was found to be preferable to a single application, although in some instances no injury from the single application was apparent.

A larger number of Perle roses were produced from plants grown in a black than in a clay loam, while the Kaiserin gave reverse results.

The sub-watering method proved an efficient means of supplying the plants with moisture.

INSECTS.

The only insects that were at all troublesome to the roses were thrips. These mites infested the young buds, being found safely en-

sconced between the unfolded petals of the flower. Their presence could always be detected in the opening of the bud, by the brownish discoloration of the injured petals. When the thrips were present in large numbers this injury was sufficient to cause the petals to adhere to each other and thus prevent the bud from expanding. During the first season they affected the plants but little, while in the succeeding two seasons they were present in large numbers on two or three separate occasions. Generally these visitations occurred during a long period of hot, dry weather. It must be remembered that the plants were in the open air most of the time, and at all times were subject to the prevailing atmospheric conditions.

INSECTICIDES.

Frequent spraying of the plants with a weak solution of Rose Leaf Extract of Tobacco, one part of the extract to seventy-five parts of water, proved efficacious. The spraying was done in the evening, and followed up in the morning by a hard syringing with water. Three or four applications were generally sufficient to destroy or drive away the thrips.

THE MAMMARY GLAND.

A. W. BITTING. D. V. M.

The mammary glands are accessory organs of generation for the purpose of supplying nutrition to the young from birth until they attain sufficient development to subsist on food independent of the mother. They are the characteristic organs of all mammals (animals that suckle their young). They differ in number, size, position and minor characters in the different species, but their function is the same—the secretion of milk. In a wild state the glands secrete only what is needed for the offspring, and continue their function for a variable time, until the young can subsist alone. The secretion from this gland is very nutritious and easily digestible. For this reason constant efforts have been made in domesticating animals to secure an increase in the quantity of milk, that it might be used as a food for people. How successful these efforts have been is attested by the numerous breeds of cattle noted for the quantity and quality of the milk which they produce. The efforts at improvement have been attended by wonderful success in increased production and in lengthening the period of lactation, but there has not been a corresponding improvement in quality.

The mammary glands are true skin glands and are to be regarded as comparable in their development to the sebaceous (oil) and sweat glands. By some they are regarded as modifications of the oil glands. The claim of relationship is based upon the fact that the secretions are much alike in that they are both rich in fatty and albuminous material. Others regard the mammary glands as modifications of the sweat glands. This resemblance is based upon their structural characters. The alveoli of the mammary glands have only a single layer of epithelial cells, a characteristic of the sweat glands. Haidenhain has shown⁴ that there is no fatty metamorphosis of the central cells in the milk glands, as in the case of the sebaceous glands, which shows that they do not agree in their physiological method of forming the fats. The weight of argument therefore seems to show that the gland is more closely related to the sweat glands than to the sebaceous glands.

The evolution of the mammary gland as shown by a study of the different forms of mammalia, is of considerable interest, but only types can be cited here. In a very low form, *Ornithorhynchus*, the glands consist of a series of about 200 club-like tubes, opening close together at two points on the surface of the skin. These masses lie on each side of the body and there is no depression or pouch, or elevation of teat to indicate the location of the openings, and they can only be distinguished by the fact that the opening of the ducts is larger than for the hair. The milk exudes and is licked off of the hair by the young.

In the *Echidna* the glands resemble those in the preceding class, but instead of each emptying separately upon the surface of the skin they all empty into a small pouch or pocket formed by a fold of skin. The mouth parts of the young are adapted to the pouch.

In the marsupials, the glands are more compacted, and small follicles are formed, into which a number of these ducts enter. There are from ten to twenty of these follicles, and each empties through a separate duct upon an eminence on the outside. This eminence corresponds to the teat, and is very rudimentary in some forms, and in a few it is quite well developed. The mammary glands of all the higher animals are only a more perfect development of the types already cited. In the dog the gland is thin and flattened, and the lobules have their ducts, which empty into still larger ducts, and these into still larger ducts, which become dilated to form pouches that act as reservoirs for retaining the milk for some time. These larger ducts, about sixteen in number, are separate from each other, and discharge on the end and sides of the teat through as many openings.

In the sow the development is carried still further. The larger ducts empty into a few large cavities or reservoirs and discharge on the end of the teat through two openings. In the mare the form of the gland is more compacted, the lobules are brought close together, there is a diminution

⁴Herman's *Physiologie*, Bd. V., p. 380.



THE MAMMARY GLAND

An antero-postero section of an udder showing injection of the fore and hind quarters with different colored mass. This brings out the distinct line of separation and also the difference in shape of the quarters. This udder shows a large amount of glandular tissue and small but numerous milk cisterns.



THE MAMMARY GLAND.

An injected udder showing large milk cisterns but small amount of glandular tissue.

of the adipose and connective tissue, the reservoirs are better defined, the teat more perfectly developed, and two glands discharge on the end of the same teat. In the cow there is a development of a larger amount of gland tissue, the presence of large and small milk ducts and reservoirs or cistern capable of great distention. The discharge is from a single duct at the end of a well developed teat.

The number and position of the mammary glands is quite variable in the different species. A single pair is the smallest number found, and eleven pairs the largest. In general it may be said that animals that bring forth only one at a birth usually have only a single pair of glands, while multiparous animals usually have more glands than the average number of young to which they give birth. While the foregoing may possibly be taken as a general rule, there are many exceptions. Probably the most notable exception is the cow, for while she ordinarily produces only one at a birth, she has four well developed glands, and often has from one to four rudimentaries. The query naturally arises, Was the cow at one time multiparous, and are the glands persistent? Also, if such be the case, were the glands distributed along the abdomen, and have they become crowded together in the inguinal region?

The udder of the cow consists of a variable number of mammary glands, usually four that are functional (the quarters) and from one to four are rudimentary. They are arranged in pairs, being on opposite sides of the median line of the body, and occupy the inguinal region (groin). The fore part of the udder begins a few inches behind the umbilicus, and the glands continue backwards, going well up between the legs. The right and left sides of the udder are separated by a well defined line or groove. Viewed from the side, the udder presents a more or less rounded sacculate appearance. The fore quarters terminate more abruptly than the hind quarters. The line of separation between the fore and hind quarters is not well marked upon the side, may not be well marked below, and is never so pronounced as the separation between the two sides.

The shape and size of the organ as a whole differs in the different breeds and in individuals of the same breed. In some breeds the aim has been to develop a large secretory function, and an enormous glandular development has been the result. In other breeds, the quality of the milk has been the prime consideration, and the gland is smaller. In the beef breeds the gland is often invaded with fatty tissue, and the udder appears large, but the quantity of glandular tissue is small. The shape also depends upon the evenness of development of the individual gland, upon the strength of the supporting ligaments and the presence of rudimentary glands. An udder with quarters not in pairs or quarters not uniform in size presents a bad shape to the eye of the critic. An udder with little or no fat or connective tissue in front to protect the large vessels as they emerge to pass along the abdominal walls will terminate abruptly. An

udder with thin, flat rudimentaries or without any at all will present a smoother outline behind than one in which they are well developed.

The appearance of the organ as regards size will depend in a measure upon the strength and shape of the abdominal wall. In a cow with loose abdominal walls, dropping directly down from the pubis, thus forcing the udder downward and backward, the organ will appear to be much larger than in one in which the walls are stronger. This sometimes accounts for the apparently sudden development of a good udder after the second or third calf. The muscles of the abdomen become more relaxed and the udder becomes more pendulous. As the gland is located just under the skin, the shape and size may be fairly judged, but accurate measurements can not be made. The weight of the dissected udders as found in our investigations varied from two pounds and three ounces to forty-one pounds and six ounces.

The skin covering the udder is very thin and elastic, and the hair is finer, softer and shorter than on other parts of the body. The skin covering the teats is deprived of hair, or nearly so, and is often of a darker color than upon other parts, thus resembling the areola. The soft skin of the udder is carried well up backward and blends with the escutcheon or milk mirror. The so-called milk mirror bears no relation to the size of the gland, as it may extend several inches above or to each side.

A dissection of the udder shows that each half is enveloped in a strong fibrous capsule, and that the fibers intermingle on the inner side and are prolonged upwards to act as ligamentous support for the gland. The halves are distinct, as they may be easily separated throughout their inner aspect. The individual glands in each half of the udder are not so distinctly separated. No line of division can be found upon the side, and very little evidence of such separation below. If a longitudinal incision be made through each half, in an uninjected state, no line of separation will be found to exist. For this reason many anatomists and writers have held that there are only two mammary glands and that each is provided with two or more openings. This probably also accounts for the popular belief that if an injury should occur to one quarter that at least part of the milk of that quarter may be drawn from its associate on the same side. If, however, an injection be made into each teat, using as many colored injection masses as teats injected, it will be found that a distinct transverse partition is present and that the injection mass in no case can leave the quarter. It therefore follows that milk drawn from any teat must be produced in that quarter. This udder formation is illustrated in Plate V.

The quarters upon each side, when taken together, present a somewhat convex border above and concave below, terminating somewhat abruptly in front and being prolonged upward and backward to a point. The fore quarters are flattened above and below, and the hind quarters present more of a spherical triangle with the apex above and backward.

The sides of the halves are about parallel in the udder when fairly distended with milk. The rudimentary glands are usually thin and flat and placed behind the so-called hind quarters. They may vary in number from one to five, and may occupy any position from in front of the fore quarters, between the quarters, on the teat, to well up behind the hind quarters. This occurrence in front of the fore quarters must be exceedingly rare, as I have never met but two slaughter house inspectors who had observed that condition. The occurrence between the quarters is occasionally seen. The rudimentary glands usually have their own teat directly below them, but in some instances the teat may spring from the side of the large teat or an opening may occur upon the side of the teat. In the cases of openings on the back or sides of the hind teats, I have found that more of them are openings from rudimentary glands than into the cavity of the teat, as usually supposed.

The structure of the mammary glands can be studied to advantage by injecting each teat, and the arteries and veins, with different colored injection masses. Each gland is enveloped in an elastic, fibrous capsule or membrane to which externally the skin is loosely adherent; internally the fibers intermingle with those of the gland from the opposite side and become prolonged upward as a suspensory ligament. The intermingling is not strong, however, as they may be separated easily upon dissection. Between the glands on the same side the capsule sends off a transverse partition common to each. The tissues of the capsule become greatly thickened and are prolonged downward to form the walls of the teat. The capsule throws off numerous reflections inward from all sides to serve as a supporting framework for the gland tissue, and for the formation of milk cisterns and ducts. This capsule and its reflections are very elastic, thus yielding readily to the change of form produced by the frequent filling and emptying of the gland.

The teat or external opening of the gland is cylindrical or conical in shape, of greater or less length and diameter, situated at the most dependent portion of the gland. Its shape and size are independent of the size of the gland. The teat is very elastic. It is covered with a tough, closely fitting, thin skin. Within it contains the duct or milk canal. In a collapsed state, the walls of the canal lie in longitudinal folds, but when the teat is fully distended these folds are obliterated. In a moderate-sized teat, the capacity of the canal when distended is from one to one and a half ounces. The teat is supplied with circular and longitudinal muscular fibers. At the lower end the circular fibers form a sphincter to close the duct and maintain it in that condition under ordinary pressure. At the upper end of the teat is another constriction, but it does not completely close the canal, and still above is sometimes found a third. These upper constrictions correspond in position to the upper and lower layers of the capsule of the udder, and are the parts usually involved in imperforate quarters. The teat is provided with a copious vascular

supply, but has no erectile tissue. Under undue excitement the arteries become greatly distended with blood, and produce a turgidity resembling erection, as in erectile tissue. This is observed in nymphomania and sometimes during the process of milking.

Above the teat is a large cavernous opening, the reservoir or milk cistern. This cistern is divided by constrictions into pockets or various sizes into which the larger milk ducts empty. At the point of interest of these ducts is a constriction due to a sphincter muscle. These sphincters can not close the entire opening, but it seems possible that they may partially do so, and this may thus account for the condition known to all dairymen as "holding up the milk." Reference to Plate V will show the sphincter muscles and their location.

The large ducts ramify in an irregular manner to all parts of the gland. They subdivide into smaller ducts, and these in turn into smaller ones, until they terminate in a simple duct with its alveolus or pocket. The large ducts anastomose very freely, but do not in the smaller subdivisions. The canal in the teat, the reservoir and ducts are lined with columnar epithelium, but just what part the epithelial cells lining these ducts have in the production of milk is not known.

The alveolus is the sacculated distention on the end of the minute milk duct. It is the essential part of the gland. It is lined by a single layer of epithelial cells, which are especially concerned in milk secretion. The cavity of the alveolus in the cow is from one two hundred and fiftieth to one hundredth of an inch in length, and from thirteen hundredths to one eight hundredth of an inch in diameter. The lining cells vary from almost a flattened form to a columnar form during the different stages of rest and activity.

The mammary glands are abundantly supplied with blood. The arterial supply leaves the heart through the posterior aorta and passes backward. This artery divides into two large branches known as the common iliacs. The common iliacs are short and divide into the external and internal iliacs. The blood for the mammary gland passes through the former as far down as the pubis, at which point a branch is given off, known as the prepubic (deep epigastric of man). The prepubic artery divides into two branches, the posterior abdominal and the external pubic, and the latter into two parts, one going to the subcutaneous abdominal muscles and the other to the mammary gland in the female. For the blood to reach the udder it must pass through the posterior artery to the common iliac, the external iliac, the prepubic, external pudic, and the mammary. The mammary artery has four principal branches, two going to the posterior gland, one branch between the glands, with nearly all its subdivisions entering the anterior gland. There is also a small branch for each rudimentary gland. The large branches subdivide within the gland tissue.

The venous circulation is more complex than the arterial. The blood

is collected from the gland by from fourteen to seventeen large vessels which empty into the mammary vein, which runs parallel with the artery at the base of the gland. The mammary vein on each side is divided into two parts, and these anastomose in front and behind the glands. A third large branch collects the blood from the teats, and the more dependent parts of the glands, extends forward and unites with the external branch above. The mammary vein enters the external pudic vein posteriorly, and the blood is conducted through the prepubic, the external iliac, the common iliac, the vena cava to the heart. The mammary vein also passes forward and becomes a part of the subcutaneous abdominal, and this becomes an internal thoracic, and returns to the heart by the way of the anterior vena cava. The mammary veins from the glands on opposite sides anastomose both in front and behind, as shown in Plate VII, so that there exists a complete circuit of veins around the whole group of glands, and a complete circuit of veins leading to the heart both forward and upward. The only thing that determines the direction of the blood is the position of the valves in the vessels. The larger volume of blood passes forward through the subcutaneous veins, thus bringing them into great prominence, and giving rise to the popular name of milk veins. These abdominal veins enter the thoracic cavity just behind the sternum on each side of the cartilage, the point of entrance into the body being known as the "milk well." See Plate VIII. As the blood may pass to the heart through the posterior vessels as well as the anterior, it would seem that undue prominence is attached to these veins in judging the milking qualities of cows. If a large volume of blood should return by way of the posterior vessels, the abdominal veins will appear less prominent. One of the factors tending to increase the size of these veins is pressure upon the iliacs as a gravid uterus.

The course of the circulation in the udder will be better understood by reference to Plate VIII, as well as Plate IX, showing the course of circulation between heart and udder.

The lymphatic circulation is also well developed. A very large lymphatic gland occupies the space above and behind the glands.

The nerve supply arises from a branch given off at the last dorsal vertebra. The nerve center controlling secretion has not been located, but it is supposed to be in the spinal cord. It is possible that the will can exercise some influence, but the evidence is not sufficiently clear to warrant drawing a positive conclusion.

PSEUDO SCABIES.

A. W. BITTING. D. V. M.

Early in February of the present year reports were received from Wabash County that sheep had been brought into that locality affected with scabies, and, furthermore, that the skin was affected with black worms. A number of sheep died and neighbors feared the presence of a new disease and the spread of infection. The correspondents were referred to the Live Stock Sanitary Commission, as being the proper authorities to deal with the question. On February 14 the commission visited the place and placed a quarantine upon the flock. Later, the owner, not being satisfied with the condition of things, sent part of the carcasses of sheep that died to the Station for examination. No scabies were found and the "black worms" in the pelt proved to be the awns of *Stipa spartea*, a grass which grows in the southwestern States, from which place these sheep had been imported. The awn or beard of this grass is very long and has great powers of penetration. The awn when started in the ground forces itself downward by the straightening due to the absorption of moisture. The beards had gotten into the skin of the sheep while grazing, and had worked along in the loose tissue beneath. The pieces ranged from one-fourth to two and one-half inches in length, and in some cases the whole seed pod had been carried with them. In only a few cases had abscesses occurred. In many places the local irritation was such as to cause the dropping of the wool in patches, thus giving a very ragged appearance to the fleece.

The cause of death, however, was due to lung and intestinal parasites.

THE EFFECTS OF EATING MOULDY CORN.

A. W. BITTING D. V. M.

During the fall and winter of the past year the State suffered the loss of a large number of cattle, supposedly due to the eating of moldy corn. The fall of 1898 was exceptionally wet, and large quantities of corn spoiled and were fed in that condition. The popular belief is that the mold or other organism producing the fermentation in the corn also causes disease in the stock. The direct experiments to prove this point have usually given negative results.



THE MAMMARY GLAND.

Plate viewing the udder from above, showing the veins completely encircling the udder and leading away both forward and backward.

Purdue Univ. Agr. Exp. Station.

Plate VIII.



THE MAMMARY GLAND.

A view showing the exposed milk veins of belly.

In co-operation with the botanical department of the Station an attempt was made to separate these organisms, and to determine the specific effect of each. Samples of moldy corn were obtained from various sources, and it was found that three organisms, one bacterium and two molds, were constant in the spoiled corn, and that the other bacteria and molds were not constant.

Purdue Univ. Agr. Exp. Station.

Plate IX.



THE MAMMARY GLAND.

A schematic figure showing the course of the artery leading to the mammary gland and the veins returning to the heart. The light colored lines represent arteries and the dark colored lines the veins.

Two horses were obtained, and, after a preliminary feeding period, 5 cc. of an active growth of bacteria in bouillon solution were inoculated subcutaneously, and thirty-six hours later 10 cc. more were injected. The effect upon the animals was not appreciable; not even so much as an abscess occurred. After a period of five days a similar test was made

with one of the molds, and after a like interval the other mold was tried. Neither of the molds caused any trouble.

The next step was to sterilize large quantities of corn meal, make a mash and inoculate with pure cultures of these same germs. By giving as a mash, by mixing with dry meal and by starvation on other foods, it was possible to get each animal, to eat about five pounds per day for five days during each of the three periods. The effect of the meal inoculated with the bacteria and one of the molds was negative. The effect of the culture containing one of the molds—a fusarium—produced redness of the gums and some salivation. The next attempt was to feed all the spoiled corn the horses would eat. They ate the corn very well for three days, and after that it was with difficulty that they could be induced to eat any. On the fifth day, one of the horses had slight salivation, occasional colicky pains, and diarrhea. On the seventh day there was some inco-ordination of movement and stupor. For two days the animal would stand part of the time with the head pressed against the wall, and then quick recovery followed. The second horse showed some irritation of the mucous membrane of the mouth, but never developed any nervous symptoms. The horse was killed, but a post mortem examination failed to show any lesions. The two horses ate together about four bushels of spoiled corn, most of it being consumed during the first week. After the first week the corn had to be mixed with other feed in every conceivable manner in order to induce the horses to eat any of it.

The results of the experiment show that inoculations with cultures of the bacteria and molds were ineffective, that the eating of the mashes containing pure cultures showed that only in the case of a growth of a species of fusarium did any intestinal disturbance follow, and that in one case the feeding of the rotted grain produced considerable intestinal disturbance and some nervous symptoms, but that the disturbance was light in the other. The disease from which the animals were reported to have died in the State was cerebro-spinal meningitis, but the experiment did not result in the production of such disease.

CONTINUED EFFECTS OF FERTILIZING THE SOIL.

W. C. LATTA.

The piece of ground devoted to this experiment has grown corn continuously since 1880. The purpose of the experiment is to determine the lasting effect of horse manure, gas lime and ammoniated phosphate in continuous corn culture. There are eighteen plats in the series, each one

rod wide and ten rods long. The even numbered plats have not been fertilized since the experiment began in 1880.

The odd numbered plats received applications of gas lime, ammoniated phosphate and fresh horse manure in 1883 and again in 1884. The plats receiving each kind of fertilizer and the aggregated amounts applied in the two years are:

	<i>Applied per Acre.</i>
Gas lime (Plats 1, 7, 13).....	500 pounds.
Ammoniated phosphate ^s (Plats 3, 9, 15).....	500 pounds.
Horse manure (Plats 5, 11, 17).....	50 tons. ^a

These plats have not been fertilized before or since the dates named above.

The effect of the gas lime and ammoniated phosphate on the yield of grain has been slight and transient, while that of the manure has been marked and lasting, as will appear from Table XXI.

^s The ammoniated phosphate contained 1.75 per cent. available and 4.09 per cent. insoluble phosphoric acid; 3.32 per cent. ammonia, and 1.07 per cent. potash K₂.

^a Estimated.

TABLE XXI.—AVERAGE YIELDS OF CORN IN BUSHELS PER ACRE, WITH AND WITHOUT FERTILIZATION.

Year.	TREATMENT OF PLATS.	Gas Lime.	Ammo- niated Phos- phate.	Horse Manure.
1883	{ Av. 3 fertilized plats	44.05	53.36	56.95
	{ Av. 5 or 6 flanking plats	47.88	52.90	47.60
	{ Av. gain from fertilization.	—3.83	0.46	9.35
1884	{ Av. 3 fertilized plats	38.23	40.68	53.48
	{ Av. 5 or 6 flanking plats	40.96	40.30	39.08
	{ Av. gain from fertilization.	—2.73	0.38	14.40
1885	{ Av. 3 fertilized plats	45.03	44.26	63.69
	{ Av. 5 or 6 flanking plats	43.61	42.43	42.20
	{ Av. gain from fertilization.	1.42	1.83	21.49
1886	{ Av. 3 fertilized plats	28.44	27.09	45.22
	{ Av. 5 or 6 flanking plats	27.79	27.19	26.32
	{ Av. gain from fertilization.	0.65	—0.10	18.90
1887	{ Av. 3 fertilized plats	5.51	6.44	6.97
	{ Av. 5 or 6 flanking plats	5.80	5.52	5.46
	{ Av. gain from fertilization.	—0.29	0.92	1.51
1888	{ Av. 3 fertilized plats	54.30	52.40	60.80
	{ Av. 5 or 6 flanking plats	54.56	54.32	52.08
	{ Av. gain from fertilization.	—0.26	—1.92	8.72
1889	{ Av. 3 fertilized plats	41.22	36.00	51.19
	{ Av. 5 or 6 flanking plats	38.99	38.76	38.09
	{ Av. gain from fertilization.	2.23	—2.76	13.10
1890	{ Av. 3 fertilized plats	32.86	31.25	38.60
	{ Av. 5 or 6 flanking plats	34.61	34.48	31.62
	{ Av. gain from fertilization.	—1.78	—3.23	6.98
1891	{ Av. 3 fertilized plats	27.28	25.13	37.45
	{ Av. 5 or 6 flanking plats	26.20	27.51	27.16
	{ Av. gain from fertilization.	1.08	—2.38	10.29
1892	{ Av. fertilized plats	24.80	22.55	33.14
	{ Av. 5 or 6 flanking plats	25.47	25.51	26.17
	{ Av. gain from fertilization.	—0.67	—2.96	6.97

NOTE—The minus sign (—) indicates a loss in every case.

The following in Table XXII is a summary of the results with, and aggregate results of the ten years' trial.

TABLE XXII.—AVERAGE AND AGGREGATE YIELDS OF CORN FOR TEN YEARS

Class of Plats.	Bushels per Acre.
Average of gas lime plats.	34.16
Average of flanking plats.	34.16
Average loss from gas lime. . . . .	.41
Average of phosphate plats.	33.91

TABLE XXII—Continued.

<i>Class of Plats.</i>	<i>Bushels per Acre.</i>
Average of flanking plats.....	34.89
Average loss from ammoniated phosphate.....	.97
Average of horse manure plats.....	44.74
Average of flanking plats.....	33.57
Average gain from horse manure.....	11.17
Aggregate yield of gas lime plats.....	341.69
Aggregate yield of flanking.....	345.87
Aggregate loss from gas lime.....	4.18
Aggregate yield of phosphate plats.....	339.16
Aggregate yield of flanking plats.....	348.92
Aggregate loss from ammoniated phosphate.....	9.76
Aggregate yield of horse manure plats.....	447.49
Aggregate yield of flanking.....	335.78
Aggregate gain from horse manure.....	111.71

As the effect of the horse manure had not vanished in ten years, it was decided to continue the experiment with the three horse manure and six flanking plats in order to get the full effect of the manure. The results of the remaining six years to date are as follows:

TABLE XXIII.—YIELDS AND INCREASE PER ACRE FROM HORSE MANURE APPLIED IN 1883 AND 1884.

YEAR.	YIELD PER ACRE IN BUSHELS.		Average Gain from Manure.
	Average 3 Manured Plats.	Average 6 Flanking Plats.	
1893	16.76	13.32	3.44
1894	24.63	20.25	4.38
1895	12.85	9.21	3.64
1896	33.50	30.29	3.21
1897	22.88	20.61	2.27
1898	25.68	22.51	3.17

The following in Table XXIV is a summary of the results with horse manure for sixteen years:

TABLE XXIV.—AVERAGE AND AGGREGATE YIELD FOR 16 YEARS.

<i>Class of Plats.</i>	<i>Bushels per Acre.</i>
Average yield of horse manure plats.....	36.48
Average yield of flanking.....	28.24
Average gain from horse manure.....	8.24
Aggregate yield of horse manure plats.....	583.78
Aggregate yield of horse flanking plats.....	451.95
Aggregate gain from horse manure.....	131.83

The yields of corn stover in this experiment are given below, in Table XXV, for eight years for the entire series, and in Table XXVI, for fourteen years for the horse manure and flanking plats. The crop of stover was not weighed in 1886 and 1887.

TABLE XXV.—AVERAGE AND AGGREGATE YIELDS OF CORN STOVER FOR EIGHT YEARS.

<i>Class of Plats.</i>	<i>Pounds per Acre.</i>
Average of gas lime plats.....	2,038.08
Average of gas flanking plats.....	1,985.90
Average of gain from gas lime.....	52.18
Average of phosphate plats.....	2,154.54
Average of flanking plats.....	1,981.93
Average gain from ammoniated phosphate.....	170.61
Average of horse manure plats.....	2,503.91
Average of flanking plats.....	1,952.92
Average gain from horse manure.....	550.99
Aggregate yield of gas lime plats.....	16,304.66
Aggregate yield of flanking plats.....	15,887.20
Aggregate gain from gas lime.....	417.46
Aggregate yield of phosphate plats.....	17,220.33
Aggregate yield of flanking plats.....	15,855.50
Aggregate loss from ammoniated phosphate.....	1,364.83
Aggregate yield of horse manure plats.....	20,031.33
Aggregate yield of flanking plats.....	15,623.50
Aggregate gain from horse manure.....	4,407.83

TABLE XXVI.—AVERAGE AND AGGREGATE YIELDS OF CORN STOVER FOR 14 YEARS.

	<i>Pounds per Acre.</i>
Average of horse manure plats.....	2,274.12
Average of horse flanking plats.....	1,883.95
Average of gain from horse manure.....	390.17
Aggregate yield of manure plats.....	31,837.66
Aggregate yield of manure flanking plats.....	26,375.33
Aggregate gain from horse manure.....	5,462.33

The results of the experiment are summed up in Table XXVII.

TABLE XXVII.—AVERAGE INCREASE FROM FERTILIZATION.

FERTILIZER.	INCREASE PER ACRE.	
	Bushels Corn.	Pounds Stover.
Gas lime	*—0.41	52.18
Ammoniated phosphate	*—0.97	170.61
Horse manure	8.24	390.17

*Loss.

Comment on the record of the gas lime and ammoniated phosphate is unnecessary. The results obtained from horse manure are not only very encouraging, but they show clearly the unwisdom of short tests of stable manure, as the beneficial effect on the yield extends over many years.

Assuming that the yields of stover in 1886 and 1887 were equal to the average yield of the other years of the test, we find that the horse manure produced an aggregate increase per acre of 131.8 bushels of corn, and 6,242 pounds of stover. Reckoning the stover worth \$5 per ton and the corn 30 cents per bushel, the value of the increase is \$55.14.

In view of the probable losses of plant food between crops in the earlier years of the experiment, and the diffusion of the soluble fertility from the manured to the unmanured plats, the results secured emphasize very strongly the importance of husbanding wisely, and of utilizing fully all the home-made manure of the farm.

TEST OF CORN CULTURAL IMPLEMENTS.

W. C. LATTA.

The test of corn cultural implements was begun in 1888 and has been carried on continuously for eleven years. Owing to a severe protracted drouth in 1893 no results of value were obtained for that year.

During the first five years of the test the corn was planted only in drills, and consequently the cultivation was "one way" only. In 1893 the plan of the experiment was changed to permit trial of the implement in hill planted as well as drill planted corn.

Since that date the drill has been cultivated one way only as before, and the hill planted corn has been regularly cultivated both ways.

IMPLEMENTS UNDER TRIAL.

ALBION SPRING TOOTH CULTIVATOR.

This is a wheel cultivator with six teeth in each gang. It thoroughly stirs the entire surface to the depth of two or three inches and leaves the soil well pulverized and fairly level.

CORN PLOW.

This is the earliest form of two horse corn cultivator with two hoes or shovels in each gang. This implement does not stir the entire surface nor does it pulverize the soil very thoroughly. It runs deeper than the spring tooth cultivator and throws the soil into furrows and ridges, thus tending to dissipate soil moisture.

THE HOOBER CULTIVATOR.

This implement has two blades in each gang and its action is to shave the soil just a little below the surface. It stirs the soil only to a slight depth and it tends to draw the dirt toward the corn rows.

TOWER CULTIVATOR.

This implement shaves the soil like the one just described. It has four blades in each gang and the gangs may be reversed so as to throw the soil alternately to and from the corn rows.

BREED'S WEEDER AND HARROW.

These tools have been used together, Breed's weeder being employed for the first two or three cultivations and the one horse harrow being used for the later cultivation. The action of both these implements is quite superficial.

HOKE CULTIVATOR.

This is a very high arch cultivator, which adapts it well for the later cultivation. It has four spring teeth in each gang. The points of the teeth are wider than those of the Albion cultivator, and it therefore throws the soil into slightly larger furrows and ridges than does the latter.

ROCK ISLAND DISK CULTIVATOR.

This cultivator effects a thorough stirring, turning and pulverizing of the soil, but as it had no wheels the depth of its working could not be controlled. It also ridges the soil along the corn row.

The soil in which the experiment was conducted is a dark colored compact loam, overlying gravel, which gives perfect natural drainage. The

soil is indeed too thoroughly drained, as the corn crop is injured by drouth in July or August almost every year.

The soil was broken seven to eight inches deep in the spring of each year. Great care was taken, throughout, to secure uniform soil conditions and to give the plats like treatment in all respects, save the kind of cultivator used.

The time that each implement was under trial and the results as to average yield of corn are shown in Table XXVIII.

TABLE XXVIII.—AVERAGE YIELDS OF CORN WITH DIFFERENT CULTURAL IMPLEMENTS.

CULTIVATOR.	Years Under Trial.	BUSHEL PER ACRE.		
		Hill-planted.	Drill-planted.	Average.
Albion spring-tooth	5	58.09	54.32	56.20
Corn plow	5	57.27	53.89	55.58
Hoover cultivator	5	54.30	53.27	53.78
Tower's cultivator	5	57.32	54.38	55.85
Breed's weeder and harrow	5	54.53	53.32	53.92
Rock Island disk	4			48.82
Hoke cultivator	1	67.61	69.53	68.57

The uniformity in yields will doubtless surprise many, but this is what one would naturally expect under the conditions of the test. The prime condition of a large yield of corn on the Station farm is an abundance of moisture during midsummer, when the crop is making its most rapid growth. Owing to the underlying deep bed of gravel, there is no reserve of free water below to be drawn upon during drouth; and the amount of capillary moisture that the shallow soil can hold is quite inadequate to meet the demands of a full corn crop. It necessarily follows, therefore, that no matter what the kind or frequency of cultivation the yield of corn on the college farm must be greatly reduced in dry seasons. On the other hand, the natural fertility and physical condition of the soil of the Station farm are such that in seasonable years any thorough method of culture which holds weeds in check and keeps the surface soil reasonably mellow will secure a good yield. It thus appears that there are two leveling agencies at work in the soil of the Station farm, both tending to secure uniformity in yield regardless of the kind of cultivator used. The first of these is a deficiency of moisture in midsummer, which, under existing conditions, no cultural implement can prevent. This is a leveling down influence. The second is the excellent chemical, physical and biological condition of the soil in seasonable years, which tends to secure a good yield with any reasonably thorough method of cultivation. This is a leveling up agency.

It does not follow that the results secured can be duplicated on stiff clay or sandy soils, or even on dark loams overlying permanently moist subsoils.

Of the implements under trial, the corn plow (with two hoes or shovels in each gang) and the Hoke cultivator stir the soil most deeply. The former would do considerable root pruning at certain times, if allowed to run its full depth. The aim was to prevent root pruning as far as possible. The Breed's weeder and harrow and the Hooper are the most shallow working of the implements tested.

The results obtained with corn cultural implements on the Experiment Station farm seem to justify the following conclusions:

1. The kind of implement is not so important as thoroughness and carefulness in using the same.

2. In well drained soils, deeply broken, and well filled with humus, deep culture of the corn crop does not seem necessary at any stage of its growth.

3. Under the conditions which exist on the Station farm, and taking into account ease of working, ready adjustability and thoroughness of work, the Albion spring tooth cultivator has given best satisfaction as a corn cultural implement.

4. It is easy to see, however, that, in a different soil, another of the cultivators under trial might give the best satisfaction. The nature and needs of the soil should be intelligently studied and the implement and method of culture should be chosen with special references to the end in view.

FIELD TESTS OF VARIETIES OF WHEAT, COVERING NINETEEN YEARS.

W. C. LATTA.

The testing of varieties of wheat in field trials was begun by the Agricultural Department of Purdue University in 1880, and this work has been carried on continuously to the present.

In all, 178 differently named varieties of winter wheat and eleven varieties of spring wheat have been grown one or more years on the University farm. All but thirty-six of these varieties have been tested under the present management. Owing partly to severe winter killing, partly to the necessarily small size of some plats, due to the very limited amount of seed obtainable, and partly to failure to germinate or grow well, no satisfactory record could be made of yield of the following named varieties, to wit: Red Chaff, Jennings' White, White Amber, Post, Treadwell,

Louisiana, Golden Straw, Trump, Rough Chaff, Russian Bearded, Lammas, Nursery, Mediterranean, Muskingum, Armstrong-White Amber, Australian, Many Headed Egyptian, Shumaker, Babcock, Ble de Bordeaux, Ble Victoria d'Automne, Froment Bigarre, Froment Rouge, Apulia, Nol. Kathia, Kujawha.

The spring wheats were grown only one season—that of 1884. They did so poorly that it was deemed unwise to continue the experiment. The results of the trial of spring wheats as to yield are as follows:

TABLE XXVIII.

NAME OF VARIETY.	Bushels per Acre.
Velvet Chaff Blue Stem	Failed.
Sibley's Black Chaff	9.24
Defiance	7.53
Black Bearded Centennial	Failed.
White Russian	11.88
Hallett's Original Red	Failed.
Hallett's Victoria White	Failed.
Fultz-Clawson	Failed.
Golden Grains	Failed.
Scotch Fife	10.56
Lost Nation	12.54

Not only were the yields low and the grains shrunken, but the chinch bugs were also harbored in damaging numbers.

The following is a complete list of the winter wheats grown, of which yields have been recorded, with their prominent distinguishing characteristics. The yield of each variety, grown more than one year, is the average of the several years grown.

VARIETIES OF WINTER WHEAT GROWN DURING PAST 19 YEARS AT PURDUE,
SHOWING AVERAGE YIELDS.

Number.	NAME.	CHARACTERISTICS OF VARIETY.				First Year Tested.	No. Years Tested.	Average Yield per Acre for Years Tested, Bush.
		Strength of Straw.	Bearded or Smooth.	Color of Chaff.	Color of Grain.			
1	Amber	Medium	Smooth	Amber .	Amber .	1881	2	16.21
2	American Bronze	Medium	Bearded	White .	Red . .	1892	6	26.29
3	Armstrong	Strong.	Smooth	White .	White .	1881	2	12.20
4	Armstrong-Diehl-Treadwell	Strong.	Smooth	White .	White .	1881	2	12.42
5	Armstrong-Lancaster	Weak .	Bearded	Amber .	Amber .	1881	5	24.79
6	Arnold's Gold Medal	Strong.	Smooth	White .	White .	1882	4	13.08
7	Arnold's Hybrid	Medium	Smooth	Red . .	Red . .	1881	5	19.20
8	Badger	Medium	Smooth	White .	Red . .	1885	4	21.68
9	Beal	Medium	Bearded	White .	Amber .	1892	4	26.08
10	Bearded Winter Fife	Weak .	Bearded	White .	Amber .	1896	2	23.62
11	Buckeye	Medium	Bearded	White .	White .	1881	2	14.41
12	Buda-Pesth	Medium	Bearded	White .	Red . .	1898	2	21.00
13	Canada Wonder	Medium	Bearded	White .	Red . .	1893	3	28.43
14	Canadian Hybrid	Medium	Smooth	White .	Red . .	1894	2	30.76
15	Champion Amber	Strong.	Smooth	Red . .	Red . .	1884	3	15.55
16	Clawson	Medium	Smooth	White .	White .	1883	6	26.07
17	Currell's Prolific	Medium	Smooth	Brown .	White .	1889	2	31.02
18	Dawson's Golden Chaff	Medium	Smooth	Brown .	White .	1897	3	9.88
19	Diamond Grit	Medium	Bearded	Brown .	Amber .	1898	2	20.08
20	Dibbles's Gold Coin	Strong.	Smooth	Brown .	White .	1898	1	22.33
21	Diehl	Strong.	Smooth	White .	White .	1881	2	17.11
22	Diehl-Egyptian	Medium	Bearded	Amber .	Amber .	1881	7	20.60
23	Diehl-Lancaster	Medium	Bearded	Amber .	Amber .	1881	7	18.58
24	Diehl-Treadwell	Medium	Smooth	White .	White .	1881	2	13.73
25	Diehl-Mediterranean	Strong.	Bearded	Brown .	Red . .	1881	3	22.55
26	Diehl-White Amber	Medium	Smooth	White .	White .	1881	2	10.12
27	Dietz-Longberry	Weak .	Bearded	White .	Red . .	1887	9	26.90
28	Dott Red	Strong.	Bearded	Red . .	Red . .	1881	5	12.34
29	Early Amber	Medium	Bearded	White .	Amber .	1892	1	24.98
30	Early Arcadian	Medium	Smooth	Brown .	Amber .	1896	3	10.09
31	Early Genesee Giant	Strong.	Bearded	Brown .	White .	1894	2	33.76
32	Early Red Clawson	Medium	Smooth	Brown .	Red . .	1890	6	31.07
33	Early Rice	Medium	Smooth	Red . .	Red . .	1887	2	21.70
34	Early Ripe	Medium	Smooth	Brown .	Red . .	1893	5	21.01
35	Egyptian	Weak .	Bearded	White .	Red . .	1881	9	31.39
36	Emporium Scott	Medium	Smooth	Red . .	Red . .	1884	5	22.66
37	European	Weak .	Bearded	White .	Red . .	1884	7	28.21
38	Extra Early Oakley	Weak .	Smooth	Amber .	Amber .	1886	4	15.09
39	Finley	Medium	Smooth	White .	Red . .	1884	5	24.09
40	Fulcaster	Weak .	Bearded	White .	Red . .	1887	8	27.53
41	Fultz	Medium	Smooth	White .	Red . .	1881	12	26.46
42	Fultz-Clawson	Medium	Smooth	Amber .	Amber .	1884	5	20.40
43	Fultz-Mediterranean	Medium	Smooth	White .	White .	1899	1	12.16
44	Genesee	Medium	Smooth	White .	White .	1887	1	2.20
45	German Amber	Medium	Smooth	White .	White .	1885	4	23.38
46	German Emperor	Medium	Smooth	Brown .	White .	1887	4	33.35
47	Gold Duet	Strong.	Smooth	White .	Red . .	1886	6	24.75
48	Golden Cross	Strong.	Bearded	Brown .	Red . .	1889	4	30.59
49	Haines	Strong.	Smooth	Red . .	Red . .	1884	3	20.79
50	Hallett's Original Red	Medium	Smooth	White .	Red . .	1884	5	23.29
51	Harvest King	Medium	Smooth	Brown .	Red . .	1898	2	16.58
52	Harvest Queen	Strong.	Smooth	White .	White .	1893	4	21.43
53	Hedge's Prolific	Strong.	Smooth	White .	Red . .	1884	7	27.04
54	Hermie's Winter	Medium	Smooth	Brown .	White .	1890	1	25.21
55	Hicks	Medium	Smooth	White .	Red . .	1885	2	19.86
56	Hickman	Medium	Smooth	White .	Red . .	1886	3	25.16
57	High Grade	Medium	Smooth	White .	White .	1887	2	21.09
58	Hindoostan	Medium	Bearded	Brown .	White .	1890	1	15.95
59	Home Maker	Medium	Smooth	Brown .	White .	1899	1	19.00
60	Hybrid Dattel	Medium	Smooth	Brown .	White .	1891	2	24.79
61	Hybrid Larned	Medium	Smooth	Brown .	White .	1891	2	27.76

VARIETIES OF WINTER WHEAT GROWN DURING PAST 19 YEARS AT PUNKE
—Continued.

Number.	NAME.	CHARACTERISTICS OF VARIETY.				First Year Tested.	No. Years Tested.	Average Yield per Acre for Years Tested, bush.
		Strength of Straw.	Bearded or Smooth.	Color of Chaff.	Color of Grain.			
62	Improved Fultz	Medium	Smooth	White	Red . .	1893	3	17.97
63	Improved Rice	Weak .	Smooth	White	Red . .	1899	2	20.24
64	International Club	Strong.	Smooth	White	Red . .	1892	2	20.26
65	Johnson	Medium	Bearded	White	Amber.	1892	4	20.23
66	Jones' Longberry No. 1	Medium	Bearded	Brown	Amber.	1893	2	18.82
67	Jones' Winter Pile	Medium	Smooth	White	Red . .	1891	6	22.06
68	Kentucky Giant	Medium	Bearded	White	Red . .	1891	2	20.71
69	Kentucky White	Strong.	Smooth	White	White .	1891	2	12.03
70	Long Amber	Medium	Smooth	White	White .	1895	3	13.54
71	Long Berry Red	Medium	Smooth	Brown	Red . .	1892	4	26.74
72	Lehigh No. 6	Medium	Bearded	White	Red . .	1890	2	24.24
73	Lancaster	Weak	Bearded	Brown	Red . .	1891	7	20.71
74	Landreth	Medium	Smooth	White	White .	1894	3	22.14
75	Lovett	Strong.	Bearded	White	Amber.	1894	2	12.95
76	Martin Amber	Strong.	Smooth	White	Amber.	1894	3	22.57
77	McCracken	Medium	Smooth	White	White .	1895	4	19.71
78	McGhee's White	Medium	Smooth	White	White .	1896	3	25.54
79	Mediterranean Hybrid	Strong.	Bearded	Brown	Amber.	1894	2	17.89
80	Michigan Amber	Medium	Smooth	Brown	Red . .	1894	16	21.73
81	Michigan Wick	Medium	Bearded	White	White .	1893	5	17.53
82	New Columbia	Strong.	Smooth	White	White .	1896	2	12.82
83	New Hybrid Prolife	Strong.	Smooth	Brown	Red . .	1896	1	22.50
84	New Monarch	Medium	Smooth	White	Red . .	1897	9	20.74
85	Nigger	Medium	Bearded	White	Red . .	1896	7	25.21
86	No. 102	Weak .	Bearded	Brown	Amber.	1896	2	14.71
87	Oakta Chief	Medium	Bearded	White	White .	1896	1	16.66
88	Odessa	Strong.	Smooth	White	White .	1892	1	20.67
89	Ohio Blue Stem	Medium	Smooth	White	Amber.	1893	3	24.14
90	Ontario Wonder	Medium	Smooth	White	White .	1899	3	23.26
91	Patagonian Trigo	Weak .	Smooth	White	White .	1895	4	15.6
92	Pedigree Giant	Strong.	Bearded	Brown	Amber.	1896	1	20.69
93	Perfection	Medium	Smooth	Brown	White .	1899	1	16.67
94	Perkins	Medium	Smooth	Brown	White .	1897	2	25.29
95	Poole	Medium	Smooth	Brown	White .	1897	4	21.27
96	Powers	Medium	Smooth	Brown	White .	1891	1	7.61
97	Pride of Genesee	Medium	Smooth	Brown	Red . .	1895	1	23.17
98	Pride of Illinois	Medium	Smooth	Brown	Red . .	1894	2	21.29
99	Raub's Black Prolife	Strong.	Bearded	Brown	Amber.	1897	9	20.21
100	Red Cross	Strong.	Smooth	Brown	White .	1899	1	16.57
101	Red Fultz	Medium	Smooth	Brown	White .	1899	3	21.69
102	Red May	Medium	Bearded	White	Red . .	1891	6	17.64
103	Red Mediterranean	Weak .	Bearded	Brown	Red . .	1894	2	19.63
104	Red Russian	Medium	Bearded	White	Red . .	1891	7	22.79
105	Red Wonder	Medium	Bearded	White	Red . .	1893	3	24.97
106	Reliable	Medium	Bearded	White	White .	1890	1	27.36
107	Reliable Minnesota	Weak .	Bearded	White	Red . .	1894	2	30.59
108	Rice	Medium	Smooth	White	White .	1892	1	23.75
109	Rickenbrode	Medium	Smooth	White	White .	1892	1	19.84
110	Roberts	Medium	Bearded	Brown	Red . .	1892	4	23.64
111	Rochester Red	Medium	Smooth	Brown	Amber.	1892	4	27.66
112	Rogers	Medium	Smooth	White	Amber.	1894	5	19.13
113	Rudy	Medium	Bearded	White	Red . .	1892	7	27.37
114	Russian Smooth	Medium	Smooth	White	White .	1893	3	22.15
115	Sandomirka	Strong.	Smooth	White	White .	1892	1	20.26
116	Shaffer	Strong.	Bearded	White	White .	1891	2	14.31
117	Sibley's Imperial	Strong.	Bearded	Brown	White .	1890	2	32.44
118	Silver Chaff	Medium	Bearded	White	White .	1891	3	19.37
119	Smooth Scott	Medium	Smooth	White	White .	1895	4	25.29
120	Stock Wife	Medium	Smooth	White	Red . .	1893	1	14.33
121	Swamp	Medium	Bearded	White	Red . .	1892	1	27.29
122	Tappahannock	Medium	Smooth	White	White .	1891	2	12.27

VARIETIES OF WINTER WHEAT GROWN DURING PAST 19 YEARS AT PURDUE.
—Continued.

Number.	NAME.	CHARACTERISTICS OF VARIETY.				First Year Tested.	No. Years Tested.	Average Yield per Acre for Years Tested, Bush.
		Strength of Straw.	Bearded or Smooth.	Color of Chaff.	Color of Grain.			
123	Tasmanian	Weak .	Bearded	. . . . .	. . . . .	1881	4	19.15
124	Tennessee Fultz	Strong.	Smooth	Brown .	. . . . .	1885	1	17.75
125	Theiss	Weak .	Bearded	Brown .	Red . .	1883	4	26.88
126	Tuscan Island Mediterran'n .	Weak .	Bearded	. . . . .	Red . .	1884	3	26.31
127	Valley	Medium	Bearded	White .	Red . .	1880	6	26.99
128	Velvet Chaff (Bearded)	Medium	Bearded	Brown .	Red . .	1881	18	28.41
129	Velvet Chaff, Brown (Sm'th) .	Medium	Smooth	Brown .	Red . .	1884	7	27.49
130	Velvet Chaff, White (Beard'd)	Medium	Bearded	White .	Red . .	1889	6	31.83
131	Velvet Chaff, White (Smooth)	Medium	Smooth	White .	Red . .	1889	5	30.43
132	Victoria	Medium	Smooth	. . . . .	White .	1881	2	13.68
133	Washington Glass	Medium	Smooth	. . . . .	White .	1882	1	16.66
134	Weedlen	Strong.	Smooth	Brown .	Red . .	1892	4	27.83
135	Willets	Medium	Smooth	White .	Amber .	1892	6	27.36
136	Wisconsin Triumph	Medium	Smooth	White .	. . . . .	1892	1	33.09
137	White Bearded Mediterran'n .	. . . . .	Bearded	. . . . .	. . . . .	1886	1	16.20
138	White Golden Cross	Strong.	Bearded	Brown .	Amber .	1895	2	22.66
139	White Leader	Strong.	Smooth	White .	White .	1893	1	12.93
140	White Rose	Medium	Smooth	. . . . .	White .	1881	2	18.06
141	World's Fair	Medium	Smooth	Brown .	Red . .	1894	2	30.17
142	Wyandotte	Medium	Smooth	White .	Red . .	1886	10	28.55
143	Yasoo . . . . .	. . . . .	Bearded	. . . . .	. . . . .	1886	3	21.12
144	York White Chaff	Medium	Smooth	. . . . .	Amber .	1884	3	18.10
145	Zimmerman	Medium	Smooth	. . . . .	Amber .	1882	6	25.16

In recent years it has been the policy of the department to limit the testing of wheats to a few standard sorts and the newer varieties advertised by seedsmen. A few old varieties are retained from year to year to determine how long the yield and quality can be maintained without deterioration, and to furnish a standard with which to compare the novelties as they appear from year to year. The following are some of the lessons taught by the experiments with varieties of wheat:

1. Varieties differ greatly in their hardiness, adaptation to soil, and in their ability to resist scab and rust.
2. All wheats appear to be equally vulnerable to the attacks of loose smut.
3. Varieties of wheat differ much in stiffness of straw, yield and quality of grain, under like conditions as to soil and treatment.
4. The light colored and soft wheats become darker and more flinty as the result of trial on the Station farm.
5. Most wheats do not fully sustain the reputation for prolificacy given them by the seedsmen.
6. Numerous highly prized new varieties do not compare at all favorably with standard well known wheats.

7. All varieties of wheat appear very susceptible to treatment. If neglected they will deteriorate, but they will quickly respond to generous treatment in the way of careful selection of seed, proper fertilization and preparation of soil, etc.

8. Varieties of wheat do not necessarily "run out." Under proper care the yield and quality of acclimated wheats may be maintained from year to year.

9. It is impossible to predict on the record made here what any given wheat will do in a different soil or in a remote part of the State. In some cases, two wheats do equally well here, when if taken elsewhere vary so greatly that one may prove a decided success and the other a failure.

10. No "rust-proof" or "fly-proof" wheat has been found; and none of the wheats tried have been able to pass severe winters uninjured.

FORAGE CROPS.

W. B. ANDERSON.

The purpose of this report is to call the attention of stockmen to a number of forage crops, new and old, that may lengthen the pasture season or that may be used as a supplemental forage when drouths make the pastures insufficient to secure profitable returns.

To prolong the pasture season would add millions of dollars to the live stock interests. It would enable the farmer to keep more stock on the same area of land, the by-products of the farm could be better utilized and more manure would be produced and returned to the soil. It would also prevent millions of sheep and cattle from being placed upon the market during the fall months, in an unfinished condition, causing a glutted market and falling prices.

Following will be found a list of forage crops that have been grown for several years here and elsewhere in Indiana. Also a number of plants that have been tested at the Station but one season.

EXPERIMENTS AT THE STATION.

The soil is a dark brown loam, with considerable gravel here and there near the surface. From twelve to twenty-four inches below, the subsoil consists largely of coarse gravel which gives perfect drainage and in a dry season does not contain sufficient moisture to produce a maximum yield.

The season, however, was a very favorable one and the well distributed rainfall supplied moisture during the greater part of the season.

BREAKING AND CULTIVATING.

The land was broken about eight inches deep, turning under a coating of barn yard manure. A perfect seed bed was made before planting.

The various crops to be tested were planted June 1 and 2, when the ground was warm and full of moisture. Two plats were sown of each variety, using a wheat drill. In sowing one plat, the drill was set at one bushel per acre (drill hoes eight inches apart) every drill hoe sowing, and the other plat was sown with the drill set at two bushels per acre. The two intervening hoes were closed. This gave a distance of twenty-four inches between the drilled rows.

All plats sown in rows twenty-four inches apart were cultivated during the early growth of the crop with a spring-toothed cultivator. The plats sown in drills eight inches apart received no cultivation.

CORN.

Common field corn was sown in rows only. It furnished an abundance of forage from August 1 to September 15. If planted early and in successive periods, it can be made to furnish forage from July 15 to October 15.

Stowell's Evergreen grew well in the cultivated rows, but very poorly in the uncultivated rows eight inches apart. Its rapid growth makes it ready for feeding earlier than field corn. It can be used as a forage from July 1 to August 1. The forage from this crop is well suited to supplement short pastures.

KAFIR CORN.

Two varieties of Kafir corn were tested, viz., red and white. The growth and yields of the two varieties were apparently the same. The sowing was too thick on both plats to secure the best yields. The stalks were too small to support the heads, hence the crop lodged badly. Kafir corn is not equal to field corn for forage; our stock has not eaten it so well, and at the Station farm it yields less per acre. Its redeeming feature is its ability to withstand drouth. It will oftentimes produce a second growth that affords considerable forage. The cultivated rows produced the best yields.

SWEET SORGHUM.

The Orange and the Amber varieties were sown. These two varieties are on a par as forage crops. They were also sown too thick unless intended for pasture. The crop lodged badly on both plats. The cultivated rows made better yields than the solid sowing.

All kinds of stock ate sweet sorghum greedily. The early cutting produced a second crop that came into head and almost equaled the first

crop in yield. Every farmer in need of a forage crop should give this plant a trial.

Four varieties of sweet sorghum were sent here for trial by the United States Department of Agriculture, Washington, D. C. Because of the small amount of seed sent, the varieties were sown in rows twenty-four inches apart, at the rate of one bushel per acre. Every variety grew larger and taller than the Orange or Amber, and made much larger yields. The varieties tested are named below in order of yield: Coleman's Kansas Orange, the M. B., and Folger's Early. One year's test is not sufficient to determine the comparative merits of these new varieties. Their increased yields over the older varieties are, no doubt, largely due to thinner sowing of seed.

DWARF ESSEX RAPE

This forage has been in somewhat general use in Canada and the northern States for several years. A number of farmers in Indiana report very favorably upon the economic value of this plant. It can be sown as early as the ground will permit in the spring and if a succession of forage is desired through the summer it may be sown at intervals of two or three weeks, thus furnishing food for the greater part of the season. If sown in July or August, in a good season, it will furnish pasture until a hard freeze kills it, oftentimes until December 15, or even until the holidays. It fills the gap made by drouth in late summer and fall. If cut for soiling or pastured close, it will in a favorable season grow a second or even a third crop without resowing. Like other rapid growing plants, an abundance of moisture is needed, to secure good results. The seed bed should be well prepared and free from weeds. If sown broadcast from three to five pounds per acre are recommended. If a good seed bed and an abundance of moisture are provided the minimum amount is sufficient. Increase this amount if less favorable conditions prevail. The rate per acre when sown in rows varies from one to three pounds. It will usually pay to cultivate the rape, in which case sow in rows eighteen to twenty-four inches apart. The rape may be sown in the standing corn at the time of the last cultivation and thus save expense in the preparation of the seed bed. This plant is especially recommended to farmers growing sheep and swine.

LEGUMINOUS PLANTS.

In estimating the agricultural value of leguminous plants, more must be considered than the yield in pounds of seed, stalk, and foliage. The roots become abiding places for bacteria that are capable of converting inert nitrogen into an available form for plant growth. Again the food contained in the leguminous plants is much more valuable than that found

in an equal weight of other plants, as corn or sorghum, because of the greater proportion of protein compounds.

These plants, as a rule, do not produce so large a yield per acre as the grain producing plants, and are not so well eaten by all kinds of stock.

SOY BEANS.

Six varieties were grown at the Station in 1898, with the following results:

Black (home grown seed).—This variety grew twenty-eight to thirty inches high. The solid sowing was equal to the cultivated rows in yield or forage and seed. Since this bean is larger than the ordinary soy bean the drill should be slightly opened to permit the same rate of seeding. This bean was ripe September 18, and made a fair yield of forage and seed.

Medium Black.—The height was twenty-four to twenty-eight inches. The yield of forage and seed was about the same on both plats. It was ripe September 18 and produced a good yield of seed and a medium yield of forage.

Early White is valuable as an early bean. It was ripe August 31. Height eighteen to twenty-four inches. It yields a small amount of forage and seed.

Yellow was ripe September 8. Height twenty-eight to thirty inches. The best yields were secured in the cultivated rows.

Edamane was ripe September 15 and produced a good yield of forage, but a poor yield of beans. Height thirty-four to thirty-eight inches.

Medium Green produced a heavy yield of beans in the cultivated rows, and reached a height of thirty-four to thirty-eight inches.

Yamagata is very late, and failed to produce a solid bean. It will furnish an abundance of forage and in a favorable season would grow a good yield of beans.

The soy bean has been very favorably commented upon by the Kansas Experiment Station where the bean meal was used in forming a feeding ration for hogs.¹ For every bushel of feed given, the following gains were made:

Kafir corn meal.....	7.5 pounds.
Kafir corn meal, 4-5, soy bean meal, 1-5.....	12 pounds.

"The hogs fattened with soy bean meal have just been marketed, while those not having it will not be ready for four or five weeks."

COW PEAS.

The cow pea has been grown for three years. Every season an excellent growth of vine was secured. Four varieties were tested in 1898.

¹ Kansas Press Bulletin, No. 24.

The yield of seed and growth of vine were decidedly in favor of the cultivated rows. However, if cow peas are grown for green manure, the solid drill sowing would prove preferable, because the vines would be more easily turned under and a perfect net work of roots would permeate the entire soil. When solid sowing is resorted to, the soil should be free from weeds and in perfect tilth. If a yield of seed is desired, and cultivation can be given, sowing in rows 20 to 24 inches apart will be the better method. The stock on the Station farm cared very little for the cow pea vines. No experiments have been made in feeding the grain. The green stems do not cure readily in this climate and are therefore not so well suited for hay as the clovers. The following varieties were tested:

Wonderful produced a very rank vine growth, especially in the cultivated rows. It would produce an abundance of green forage or green manure. It came into bloom September 18, but failed to produce seed.

Black was very irregular in its ripening—some vines in bloom, others with green or even matured pods. It produces a medium amount of forage. In a long growing season this variety would doubtless produce a fair yield of seed.

Whip-poor-will made a fair vine growth and matured an excellent crop of seed. Its rapid growth and early maturity recommend it as a useful variety in this latitude.

Clay made a very poor growth of vine and produced no seed. The plants from the start showed little vitality. This perhaps was partly due to a poor quality of seed. It is inferior to the other varieties as a forage or for seed.

FIELD PEAS (NEW VARIETIES).

Two varieties of field pea were tested in 1898. The Idaho was grown the previous year. The Russian was sent there by the United States Department of Agriculture, Washington, D. C., and was given its first trial.

These varieties are far inferior to the soy bean or cow pea. Results of limited tests made with them here, are against their use as forage crops.

MISCELLANEOUS CROPS.

Canada field peas and oats have been sown repeatedly in combination and have given very satisfactory results as a forage, both in the green and cured state. The mixture forms an almost "balanced ration," is very palatable and produces heavy yields. It has been tested at this Station and on a number of farms in this State for a number of years. Since oats and Canada peas both are able to stand light frosts without injury, the seed can be sown very early in the spring and will produce a forage for early summer use. If planted at intervals of about two weeks a succession of valuable forage may be secured throughout the season. If fall forage is desired barley or spring rye should be substituted for the oats.

Any of the mixtures will usually grow on the great variety of soils throughout the state. The land should be plowed deep and all sod or manure well turned under.

After a good seed bed has been secured the oats may be sown broadcast on the ground and followed with a wheat drill. This method places the peas deeper in the ground than the oats and the drill tends to cover the oats near the surface. For two years past on the Station farm we have mixed the oats and peas together, half and half, and drilled them in with a common wheat drill with entirely satisfactory results.

The rate of sowing varies in common practice, according to the nature of the soil and the use for which the crop is intended. If sown on very fertile land and for grazing purposes, $1\frac{1}{2}$ to 2 bushels of each per acre may be sown. If on thinner land, or if intended for soiling purposes and hay, one bushel of peas with one bushel of oats will doubtless give more satisfactory results. This forage mixture should be given a trial wherever a supplemental forage crop is needed.

VETCHES.

The Hairy or Sand vetch was tested last season. This variety is an annual leguminous plant, a native of western Asia. It was first introduced into the United States in 1847. It is a trailing herb, one to two feet long. The flowers are purple. The stems are covered with fine hairs. It may be sown in the spring if wanted for summer forage, or if sown in August it will provide late fall pasture and afford very early pasture in the spring.

This plant should be sown with a "nurse crop," as oats, if sown in the spring, or rye, if sown in the fall. The nurse crop supports the trailing stems of the vetch and prevents its being injured by coming in contact with the soil. The seed is too high priced to permit the extensive growing of this plant at present.

CO-OPERATIVE EXPERIMENTS.

To gather information in regard to the adaptability of these forage crops in different parts of the State, letters of inquiry were sent out to persons residing in northern, central and southern Indiana. Extracts from the replies are given below:

FROM C. B. BENJAMIN, LAKE COUNTY.

Stowell's Evergreen.—"Usually plant about May 24. Estimate yield is forty bushels per acre. May be fed green and cured for fodder. This is a most excellent feed to tide cattle over a drouth.

"Canada Field Pea and oats are sown about April 14, at the rate of one bushel of peas and two bushels of oats to the acre. The yield of grain

is about thirty-five bushels per acre. If cut and cured for hay the yield is usually about two and one-half tons per acre. This mixture when fed green or cured for hay is nearly equal to clover. It is an excellent soil renovator and is very desirable for feed. From my own experience and from that of my neighbors I can recommend sweet corn, mangels, and peas and oats."

FROM CAL HUSSELMAN, DEKALB COUNTY.

Stowell's Evergreen.—"Usually plant about May 10 at the rate of six quarts per acre. It is fed green on grass and yields 25 to 30 tons per acre. It is the best soiling crop grown on the farm.

"Grey Eye and Early Black cow peas have been planted from June to August at the rate of sixteen quarts per acre. The cow pea has been used for green manure only.

"Crimson clover is sown here in July and August at the rate of twenty quarts per acre and is used for a green manure and a clover crop."

FROM J J W BILLINGSLEY, MARION COUNTY.

Stowell's Evergreen.—"Plant as soon as the ground is in suitable condition, following up with another plat ten days later, and so on, planting at four or five different periods.

"Sorghum is planted as soon as the soil is warm enough to secure good germination. The soil, for sorghum, should be well pulverized and free from weed seeds. After the ground is made fine and level, planting is done with a two-horse wheat drill, sowing about one and one-fourth bushels per acre. It requires no cultivation, except to pull the large weeds before the sorghum shades the soil. We commence cutting the sorghum when about three feet in height, and later in the season, if a favorable one, the second crop will be quite as good as the first, and the stalks finer.

"Oats and peas have been used for forage, sowing one bushel of peas to one and one-half bushels of oats. They grow rank in rich land. The cows will hunt out the oats and leave the peas. Later in the fall, early varieties of corn are planted to give a succession of forage."

FROM D. B. JOHNSON, MORGAN COUNTY.

Canada Field Peas and Oats.—"Have been grown here two seasons and judging from their growth they would make an excellent soiling crop, but there is too great a difference in the time of ripening between the peas and the oats to secure a valuable hay crop. The peas were dead ripe and shelling out when the oats were in condition to cut.

FROM N. D. GADDY, JENNINGS COUNTY.

"Kafir corn is sown at the rate of one to four quarts per acre and cut for fodder. Corn is better than kafir corn.

"Soy beans are sown in May and June, one-half bushel per acre. Estimated yield of seed is twenty bushels and of hay one and one-half tons per acre.

"Cow peas are sown here in May and June, one-half to one bushel per acre, and yield about twenty bushels of seed and one to two tons of hay per acre. They are better than soy beans for hay and as a fertilizer. They may be sown in rows, drills or broadcast.

"The Whip-poor-will, Black Eye and the Black have been tested and usually mature seed. The Wonderful does not produce seed as a rule. For hay, cut when the pods are filled, but before any are ripe."

FROM T. E. ELLISON, ALLEN COUNTY.

"Experiments here show the kafir and sweet sorghum to be inferior to field corn.

"Peas and oats are grown annually and make excellent hay or may be placed green in the silo. This forage is cut when coming into bloom and produces from six to seven tons of dry hay per acre. There is a great deal of work connected with curing it for hay. It is allowed to remain for a long time in cocks to perfect the curing process."

FROM DR. H. S. WOLFE, FLOYD COUNTY.

"Cow peas should be planted when the ground is warm and mellow. They may be sown with a wheat drill. The yield of forage may be greatly increased by using fertilizer. Sow one bushel per acre with drill, one-half bushel if planted in rows and one and one-fourth if sown broadcast. Cow peas may be used for pasture, as a hay or a soiling crop. Stock will learn to eat cow peas readily. They equal clover as a fertilizer and are superior to it in low, wet lands. Fifteen bushels of seed and two and a half tons of hay are estimated yields per acre. The Black, Whip-poor-will and Clay have been grown.

"The Black is preferred in this locality. No one will go amiss who sows cow peas in any way.

ANALYSES OF FEEDING STUFFS.

H. A. HUSTON AND A. H. BRYAN.

ANALYSIS OF LARGE GREEN OKRA SEED.

Very few analyses of this material are on record. The plant is botanically a near relative of the cotton plant, and since cotton seed is so generally used, it may be of interest to record additional facts about the okra seed.

TABLE XXIX.

SUBSTANCES.	Air Dry Condition. Per Cent.	Water Free. Per Cent.
Moisture	6.45	17.08
Ether extract	15.98	23.70
Crude protein	22.18	25.64
Crude fibre	23.99	4.49
Ash	4.20	29.07
Carbohydrates	27.20	3.870
Total nitrogen	3.542	3.561
Albuminoid nitrogen	3.350	.219
Amide nitrogen	0.192	14.92
Starch (diastase method).	14.06	14.66
Carbohydrates extracted by 1¼ per cent. sodium hydrate	13.15	

The carbohydrates extracted by 1¼ per cent. sodium hydrate are determined by making the usual extraction with 1¼ per cent. sulphuric acid, following the ether extraction. The residues, 3 or 4, are dried and weighed, nitrogen determined in 1 or 2, and the usual fibre determination completed with the other two. The sum of the albuminoids, and residue from the treatment with 1¼ per cent. sodium hydrate subtracted from the residue from the treatment with sulphuric acid gives the amount of nitrogen free material removed by the sodium hydrate.

In the case of the okra seed, the sum of this nitrogen free material extracted by dilute alkali, and the actual starch, is practically identical with the "carbohydrates," as determined by difference, indicating that starch was the only carbohydrate removed from this seed by sulphuric acid.

The oil extracted from okra seed failed to react with sulphur, carbon bisulphide and amyl alcohol, the characteristic test for cotton seed oil.

BUCKWHEAT.

The following figures in Table XXX, are of a sample of buckwheat.

TABLE XXX—BUCKWHEAT.—WHOLE GRAIN.

SUBSTANCES.	Air Dry Condition. Per Cent.	Water Free. Per Cent.
Moisture	9.22	2.96
Ether extract	2.72	14.84
Crude protein	13.62	11.17
Crude fibre	10.25	1.92
Ash	1.76	69.11
Carbohydrates	62.43	2.40
Total nitrogen	2.18	1.82
Albuminoid nitrogen	1.65	0.58
Amide nitrogen	0.53	58.05
Starch (diastase method).	53.28	7.43
Carbohydrates extracted by dilute sodium hydrates	6.01	0.30
Galactan	0.28	7.43
Pentosans	6.82	

Structurally, the buckwheat plant occupies an intermediate position between plants yielding a high amount of galactan, such as the clovers, and those low in galactan, such as the grasses. Chemically, it does not occupy the same relative position, since the content of galactan is relatively low.

RAUH'S STOCK FOOD.

A SPECIAL CATTLE FOOD.

This is highly nitrogenous food, intended to increase the flow of milk. It is rather unusual, since it contains a large amount of animal matter. It is a mixture of side products of flour or hominy mills, with side products of the packing house in the form of cracklings. The mixture has the odor of the cracklings and the cattle did not take it readily. To remedy this, the manufacturer added some fenugreek.

TABLE XXXI.

SUBSTANCES.	Natural Condition.	Water Free.
Moisture	11.94	11.05
Ether extract	9.74	60.98
Crude protein	53.70	1.30
Crude fibre	1.15	0.26
Ash	0.23	26.41
Carbohydrates	23.24	9.72
Total nitrogen	8.56	8.27
Albuminoid nitrogen	7.28	1.45
Amide nitrogen	1.28	20.19
Starch (diastase method)	17.77	4.50
Carbohydrates extracted by 1¼ per cent. sodium hydrate	3.96	

This food is very high in both fat and protein. It was tried on an extended scale in a large dairy, but abandoned on account of the general dislike of the cattle for it.

DISTILLERY SLOP.

Table XXXII shows the same composition of a sample of distillery slop sent the Station.

TABLE XXXII.—DISTILLERY SLOP.

SUBSTANCES.	In Original Condition. Per cent.	Water free. Per cent.
Dry matter	4.22	. . . . .
Water	95.78	. . . . .
Ether extract	0.38	9.13
Crude protein	1.22	28.41
Crude fibre	0.29	6.81
Ash	0.02	0.45
Carbohydrates	2.31	55.20
Total nitrogen . . . . .	.192	4.54
Albuminoid nitrogen. . . . .	.144	3.40
Amide nitrogen. . . . .	.048	1.14
Starch (diastase method).	0.63	14.98
Carbohydrates extracted by dilute sodium hydrate	0.33	9.13

It is of interest to note that the diastase method shows considerable starch remaining after the operations of the distillery are completed. A ton of this distillery slop would contain only as much dry matter as one and two-thirds bushels of corn. The proportions of the ingredients, however, are different, since the total protein in a ton of the slop is equal to that in four bushels of corn. The apparent value of this is, however, reduced somewhat by the fact that over one-fourth of the nitrogen is in the amide form and not in the form of real albuminoids.

COMPARISON OF PROTEIN CONTENT OF TWO SAMPLES OF CORN.

A sample of corn was received, for which the grower claimed superior feeding qualities, basing the claim largely on the shape of the kernel. The protein content of this corn was compared with the protein content of a sample of Purdue yellow corn, raised on the Station farm. This corn had a kernel very different in shape. Calculated to dry matter, the corn for which special claim was made contained 12.5 per cent. of protein, while the Purdue yellow contained 12.2 per cent. of protein. As the difference was so slight, no further work was done on the subject. The protein content of both samples is about 2 per cent. above the average for dent corn.

COMPOSITION OF MANGELS AND OF SUGAR BEETS.

On the Station farm there were raised the past season four varieties of mangels and many varieties of sugar beets.

The use of beets as a succulent food is on the increase, and it may be of interest to compare the mangels with the sugar beet, which latter

is also growing in favor as a stock food. Both sugar beets and mangels are subject to a bacterial disease. An analysis of diseased sugar beets of same kind and average weight as sound beets is also included in Table XXXIII.

The most notable difference between the mangels and the sugar beets is the amount of water present in the mangels. On the basis of the average dry matter shown in the analysis of the mangels, it would require 2.4 tons of mangels to yield as much dry matter as one ton of sugar beets. Stated in another form, when the farmer harvests a ton of mangels he harvests 1,846.6 pounds of water and 153.4 pounds of feeding material; when he harvests a ton of sugar beets, he harvests 1,630.2 pounds of water and 369.8 pounds of feeding material. It is cheaper to raise water with a pump than to haul it in from the harvest field and provide storage for it.

It is often stated that mangels contain more protein than sugar beets. These analyses show that the crude protein of the sugar beets raised on the same land is greater than the average protein content of the mangels. Other analyses of sugar beets and mangels show the same thing. Not only is the crude protein of the sugar beets greater than that of the mangels, but the real albuminoids of the sugar beets are 43 per cent. greater than are real albuminoids of the mangels.. The crude protein of feeding materials is calculated by multiplying the total nitrogen by 6.25. In the case of seeds, no serious error is introduced by this, since nearly all the nitrogen in seeds is in the form of real albuminoids. But in the case of green feeds it often happens that a considerable portion of the nitrogen has not been stored in the form of real albuminoids, but in a form having a lower nutritive value. In the case of beet roots, this difference is greater than in most other feeds, for considerable of the nitrogen is in the form of nitrates, which have no feeding value, but are even injurious.

The reason for the belief that mangels are richer in protein than sugar beets are, has probably been due to a misunderstanding, growing out of the fact that the ratio between the protein and carbohydrates is closer in mangels than in sugar beets. This is not due to any deficiency in the absolute quantity of protein in the sugar beets, but to the deficiency of sugar in the mangels.

The regular diastase method gives something which is entered as starch, although it is perhaps doubtful if real starch exists in the roots. It will be noticed that in the case of the sugar beets, where sugar was determined by the polariscope, the sum of the sugar, starch and carbohydrates extracted by sodium hydrate from the residue left on treating with dilute sulphuric acid exceeds the total carbohydrates of the fodder analysis. This is doubtless due to the destruction of some sugar in drying the material. This is a difficulty met with in handling other material; in looking up analyses of tomatoes, for example, a considerable number of cases were found where the sum of the sugar, malic acid and ash exceeded the total dry matter.

TABLE XXXIII.—CHEMICAL COMPOSITION OF VARIETIES OF MANGELWURZELS AND SUGAR BEETS, IN PER CENT.

SUBSTANCES.	MANGELWURZELS.				SUGAR BEET. KLEINWANZ- LEHEN.		MANGELWURZELS. WATER FREE.				SUGAR BEET. WATER FREE.	
	MANGELWURZELS.			Dis- eased.	Sound.	Dis- eased.	Giant Yell'w.	Golden Tank- ard.	Cham- pion Yell'w.	Mam- moth Yell'w.	Sound.	Dis- eased.
	Golden Yell'w.	Golden Tank- ard.	Cham- pion Yell'w.	Mam- moth Yell'w.								
Dry matter	6.53	8.82	8.37	7.76	18.49	7.05	1.60	1.04	0.93	0.45	0.39	0.58
Moisture	93.47	91.18	91.63	92.24	81.51	92.95	20.43	17.50	20.44	15.53	9.31	8.79
Ether extract (fat)	0.10	0.08	0.70	0.03	0.07	0.04	10.26	8.19	8.59	9.75	7.27	10.96
Crude protein	1.33	1.40	1.70	1.20	1.72	0.61	13.53	11.58	12.97	11.34	3.36	9.20
Fibre . . . . .	.87	.66	.71	.75	1.35	.77	53.88	61.69	57.08	62.96	79.65	70.47
Ash . . . . .	.30	.92	1.06	0.36	0.62	0.64	8.26	2.80	3.27	2.43	1.49	1.40
Carbohydrates	8.53	4.97	4.81	4.92	14.73	4.99	1.03	0.03	1.08	0.95	0.59	0.96
Total nitrogen	0.212	0.224	0.272	0.192	0.275	0.097	2.26	1.97	2.19	1.57	8.91	0.44
Albuminoid nitrogen	0.065	0.074	0.089	0.070	0.108	0.067	6.85	11.89	6.97	6.79	10.98	10.40
Amide nitrogen	0.147	0.150	0.183	0.122	0.167	0.030	3.47	3.51	5.08	4.33	1.12	4.40
Starch (diastase method)	0.44	0.91	0.49	0.52	2.02	0.73	6.27	5.38	6.27	5.71	3.68	6.00
Carbohydrates extracted by dilute sodium hydrate	0.24	0.28	0.48	0.34	0.20	0.30	3.47	3.51	5.08	4.33	1.12	4.40
Real albuminoids	0.41	0.46	0.56	0.44	0.63	0.42	6.27	5.38	6.27	5.71	3.68	6.00
Sugar by polariscope . . . . .	...	...	...	...	14.2	6.9	...	...	...	...	...	...

In view of the fact that the sugar beets contained 40 per cent. more real albuminoids and 223 per cent. more carbohydrates than the mangels, it would seem that the higher feed value of the sugar beets would more than compensate the grower for the extra cost of harvesting them.

MATERIAL FOR PACKING HORSES' HOOFS.

H. A. HUSTON AND A. H. BRYAN.

This material is said to be a natural product, and is ground and used in the form of a stiff paste. The material in the natural state has much the appearance of soapstone. The color is yellowish green, feel greasy, streak white, and hardness, 1. The analysis in Table XXXIV shows that the principal ingredients of the material are as follows:

TABLE XXXIV.

<i>Substances.</i>	<i>Per cent.</i>
Water (at red heat).....	12.20
Silica	59.53
Oxides of iron and alumina.....	23.20
Calcium oxide	0.68
Magnesium oxide	1.02
Sodium oxide	2.06

There is little iron present, so that the material may be considered essentially a hydrated silicate of alumina.

COMPOSITION OF BONES OF SOUND HORSE AND OF BONES OF HORSE SUFFERING WITH OSTEOPEROSIS.

H. A. HUSTON AND A. H. BRYAN.

Some time ago Dr. A. W. Bitting made an extensive series of investigations on horses suffering with osteoperosis. In the course of these investigations the samples here reported on were collected. The two animals from which the bones were taken were in fair condition, so far as relates to flesh, but not fat. Their estimated weight was 1175 pounds each. After the animals were killed the bones were well cleaned from

flesh and dried for a long period in the air. The weights of the air dried bones were as follows:

	<i>Normal.</i>	<i>Diseased.</i>
Head without teeth.....	3700 grams	2100 grams
Femur.....	1575 grams	725 grams
Humerus.....	1015 grams	650 grams

The humerus of each animal was taken for analysis. The bone of the normal horse was yellowish in color, while that of the diseased animal was grey and very brittle.

The analysis gave the following results, as shown in table XXXV.

TABLE XXXV.—COMPOSITION OF HORSE BONE, PER CENT.

SUBSTANCES.	Normal Bone.	Diseased Bone.
Moisture	4.43	6.69
Fat (ether extract)	7.45	0.50
Ossein (nitrogen x 5)	16.50	27.00
Other organic matter* (nitrogen free)	15.44	6.31
Phosphoric acid	21.61	23.75
Carbon dioxide	1.30	3.60
Silica	0.13	0.27
Calcium oxide	30.14	31.32
Magnesium oxide	0.45	0.85
Sodium oxide	0.65	0.34
Total	98.10	100.63

The loss in the case of the normal bone is probably due to failure to obtain all the moisture present. Moisture was determined by drying five hours in hydrogen at 100° C.

While marked differences appear in the composition of the two bones when expressed in percentages as above, the great difference in weight of the two bones of the same size does not permit of a fair opinion being formed of the changes really taking place in passing from normal to diseased condition. This can be seen better by a comparison of the actual weights of the different ingredients in the two bones, as shown in table XXXVI.

* This was determined by subtracting the sum of moisture, ossein and fat from the amount of total combustible matter.

TABLE XXXVI.—WEIGHTS OF SUBSTANCES IN HORSE BONE IN GRAMS.

SUBSTANCES.	Sound Bone.	Diseased Bone.
Moisture	44.965	43.485
Fat	75.618	3.250
Ossein	167.475	175.500
Other organic matter	156.716	41.015
Phosphoric acid	219.342	154.375
Carbon dioxide	11.195	23.400
Silica	1.320	1.755
Calcium oxide	305.921	203.580
Magnesium oxide	4.568	5.525
Sodium oxide	6.598	2.210

A small grain of ossein seems to have occurred. This, however, may have been due to a modification of the nitrogen content during the changes incident to the disease. Properly speaking the figures really show a gain of nitrogen equal to 1.54 grams or 0.15 per cent. of the weight of the normal bone. This difference might be found between two sound bones. The most conspicuous changes are in the reduction of the amounts of fat, phosphoric acid, lime, soda and nitrogen free organic matter.

ANALYSES OF MAPLE SUGAR.

H. A. HUSTON AND A. H. BRYAN.

Four samples of maple sugar sent from Lawrence County were examined. Nos. 1 and 2 were made in Lawrence County. No. 1 was rather light color and considered a superior article; No. 2 was also of light color, but rather moist and was made later in the season by the same maker as No. 1. It was of the quality called "sappy." No. 3 was the firm light brown molded cake so common in our markets, while No. 4 was quite dark, soft and of quite different flavor from the others. It was considered of as poor quality as could be found on the market. Table XXXVII shows the results of the analyses.

TABLE XXXVII.—COMPOSITION OF SAMPLES OF MAPLE SUGAR IN PER CENT.

SUBSTANCES.	No. 1.	No. 2.	No. 3.	No. 4.
Moisture.	10.34	11.95	8.26	10.50
Ash	1.18	0.90	2.41	0.92
Sugar, direct polarization	85.30	83.30	80.60	61.40
Sucrose (official method)	85.00	82.60	80.00	65.60
Reducing sugars	3.40	3.50	3.20	20.04
Protein (N. x 6.25) . . . . .	.....	.....	0.30	0.30
Malic acid . . . . .	.....	Trace.	5 60	2.08

It will be seen that the analyses of Nos. 1 and 2 differ but little, although there was considerable difference in flavor. No. 3 is notable for its higher ash and the large yield of malic acid, while the physical qualities of No. 4 are due to the high amount of reducing sugar, due probably to bad management in the process of manufacture.

Accompanying these samples of sugar was a sample of what is known by maple sugar makers as "nitre," or "sugar sand." The air dry material showed:

Moisture	6.11 per cent.
Organic matter	70.76 per cent.
Ash, not recarbonated.....	23.13 per cent.
A more extended analysis showed the material to contain	
Moisture	6.11 per cent.
Insoluble in water.....	9.13 per cent.
Reducing sugars	12.74 per cent.
Sucrose	26.88 per cent.
Calcium	12.89 per cent.
Malic acid	20.86 per cent.
Magnesium	trace per cent.
Potash	0.72 per cent.
Protein (N. x 625).....	.40 per cent.

The material is sometimes known as malate of lime.

The malic acid was determined by the method given in Wiley's *Practical and Prac. Agr. Anal.*, Vol. III, p. 601. The Kayser method given in Allen's *Com. Org. Anal.*, Vol. I, p. 512, proved unsatisfactory in the presence of so much sugar.

Where this "nitre," which is a waste product, has accumulated to any great extent, it ought to be of some value as a source of malic acid.

TESTS FOR THE STRENGTH OF SOLUTIONS OF FORMALDEHYDE

H. A. HUSTON.

The increase in the use of formalin makes a ready means of determining the amount of actual formaldehyde in the solution very desirable.

Allen's *Commercial Organic Analysis*, 3d ed., p. 219, states on authority of W. A. Davis, that in solutions of fair purity, the amount of formaldehyde may be determined by the specific gravity. A table is given showing the percentage by weight and volume of formaldehyde present in solutions of various specific gravities. This table has been revised, as

the earlier figures were not applicable to the purer solutions sold in the last two years. These figures relate to foreign samples and it was determined to see if they were applicable to goods found on the American market.

For this purpose a number of samples of commercial formalin was purchased and the specific gravity and formaldehyde content determined. For the determination of formaldehyde a number of methods have been suggested. The oldest method is to treat the solution with an excess of ammonia of known strength, and after 24 hours to titrate the excess of ammonia with standard acid. Litmus is the most satisfactory indicator for this purpose. Another method is based on the fact that formaldehyde combines with cyanide of potassium. This method was published by Dr. R. Romijn, in *Zeit. für Anal. Chemie*, 1891, p. 19. The abstract of it given in *The Analyst*, and as used in Allen, is incorrect and introduces a very large working error. When the original working directions are followed, the method is a very satisfactory one, both in rapidity and accuracy. The above two methods were used to determine the formaldehyde in the samples under consideration.

Table XXXVIII shows the results which were obtained:

TABLE XXXVIII.

SAMPLE.	Specific Gravity.	Per Cent. Formaldehyde by Davis' Table.	Per Cent. Formaldehyde by Ammonia Method.	Per Cent. Formaldehyde by Potassium Cyanide Method.	Retail Price per Lb.
No. 1	1.077	28.1	35.05	35.44	\$0 45
No. 2	1.075	27.5	36.94	36.69	60
No. 3	1.061	22.8	35.20	35 (W)	65
No. 4	1.084	30.3	37.71	38.41	45
No. 5	1.093	32.33	37.26	37.86	50

Samples 1 and 4 were from goods shipped in large demijohns, while the other samples were in the maker's original one pound bottles. All were sold as 40 per cent. solutions.

It is evident that these samples, drawn from five different manufacturers, are of such a character that Mr. Davis' table can not be used to determine the formaldehyde content from the specific gravity. Of the two chemical methods, Dr. Romijn's studies show that the cyanide method is the better, especially when impurities are present. It is also much quicker and the end reaction is very sharp. It takes but a few minutes to make a determination by this method, and the only standard solution required is an acid solution of nitrate of silver 1-10 normal.

Against this are checked the cyanide and sulpho-cyanide solutions. It

hyde. Sometimes the per cent. of formaldehyde "by volume" is used instead of the per cent. by weight. In these samples, numbers 2, 4 and 5 would exceed 40 per cent. by volume.

REDUCING POWER OF TAKA-DIASTASE.

H. A. HUSTON AND A. H. BRYAN.

Taka-diastrase has often been used in the place of diastase in the determination of starch, and its use for this purpose has been advocated because it was believed that it would not reduce Fehling's solution, and hence no correction would be required, such as must be found and introduced for every solution of malt. While it is true, a solution of taka-diastrase in water does not reduce Fehling's solution, yet a solution of taka-diastrase treated in precisely the same way that it would be treated in a case where it was substituted for malt extract in determining starch, shows a marked reducing power. A sample of taka-diastrase from Park, Davis & Co. was examined by dissolving 50 milligrams of it in 50 cc. of water, adding 20 cc. hydrochloric acid, s. g. 1.125, and boiling under return condenser for two hours. By this method it was found that 50 milligrams of taka-diastrase reduced to cuprous oxide a quantity of copper solution yielding 17.2 milligrams of metallic copper. This quantity is too great to be neglected in starch determinations, yet the constant for a given lot of taka-diastrase may be determined once for all, and in this way it provides a reagent far more convenient than malt.

RUSSIAN APPLES IN INDIANA.

JAMES TROOP.

During the extremely cold winter of 1884-5, when the mercury dropped to 34 degrees below zero, many of the fruit trees in Indiana were killed, and people very naturally turned their attention to securing hardier trees, which would stand the extremes of temperature to which it seemed the State had become subject.

About that time the experiments of Prof. J. L. Budd, of the Iowa Agricultural College, with the Russian fruits, were beginning to attract attention, and so it was decided to plant an experimental orchard, which would consist for the most part of the Russian varieties, for the purpose of securing a hardy class of trees, and also determine whether or not these foreign winter varieties would be adopted to a climate so far south. It was argued that many of these varieties were found growing in their native country where the climate was about equal to that of Indiana. It was known that a few summer and fall varieties had been imported 30 or 40 years before, and were classed among our standard varieties. The most common among these were the Red Astrachan, Oldenburg, Alexander, Fameuse, and Tetofsky, all well known varieties and grown extensively at the present time, both for market and culinary purposes.

In the spring of 1886, about five acres were planted to apples, pears, plums and cherries, the greater portion of the trees coming from the importations of Professor Budd. In 1888, about 200 more trees, from the same source, were set out. Although the soil and climate conditions of the college farm are unfavorable for an apple orchard, these trees have nearly all made a vigorous growth, and the most of them have been in bearing for several years. Although we have not had such another severe winter as that of 1885 since the trees were planted, yet we have no reason to doubt that they will stand any amount of cold that we are likely to have, in this section of the country at least.

The trees, as a rule, are all right, but when fruiting time came, our expectations were not fully realized. We had hoped to find a few varieties, at least, that would prove themselves to be good keepers, and that could be substituted for some of our tender native varieties, but not one variety in the whole list can be classed as a winter apple in Indiana.

DESCRIPTION OF VARIETIES FRUITING THE PRESENT SEASON.

ARABKA.

This variety makes a good appearance in the orchard, making a vigorous growth, with a low and spreading head. The fruit is medium to large, having the bloom and general appearance of the Blue Pearmain. The quality is only medium, and rather tart, until fully ripe. It would probably do pretty well as a late fall market apple. It will not keep, however, later than November, unless kept in cold storage.

ANTENOVKA.

Tree upright, fruit large, yellow, very showy, and for that reason would sell well in the general market. The quality, however, is only medium, not so good as our Wealthy, but ripening about the same time.

BOGDENOFF WHITE.

The tree is somewhat spreading in habit, making a good, vigorous, hardy growth. The fruit is quite large, yellowish white, crisp, sub-acid, and of very fair quality. Ripens in September.

BOIKEN.

This was one of the first varieties to begin bearing in 1891, and has borne more or less fruit every season since. In fact, it is one of the most productive varieties in the whole list. The tree is low and quite spreading, with rather slender branches, necessitating severe pruning, if it is desired to keep the orchard cleanly cultivated. Fruit large, greenish yellow, with splashes of red in the sun. Flesh moderately tender, sub-acid and of fairly good quality, especially for culinary purposes. Professor J. L. Budd, of Iowa, states that this apple ought to keep well into winter in Central Indiana, but we never succeeded in keeping it later than November.

BOGDENOFF.

Tree spreading, fruit large, smooth, green somewhat russeted and slightly striped in the sun.

CROSS.

Tree moderately spreading, fruit medium to large, oblate, striped, of fairly good quality.

CHAMPAGNE PIPPIN.

Tree upright, somewhat spreading, fruit large, oblate, striped, a very desirable early apple, as it makes a good appearance in the market.

DANZIGER KANTAPFEL.

Danziger Kantapfel is a spreading tree, fruit red, medium in size, and of fairly good quality, keeps well into fall.

ERDBER'S STRIEFLING.

Erdber's Striefling is medium in size, oblate-conical, red in the sun. Tree spreading in growth.

ENGLISH PIPPIN.

English Pippin is much like Longfield in size and appearance, but the tree is more spreading in habit and makes a more vigorous growth. It is an annual bearer of a rather small, handsome apple, which is fine for culinary purposes and fairly good for dessert.

FAMEUSE.

This old variety is better adapted to the climate of Michigan than Indiana, especially the south half of the State. It is a very desirable dessert apple, when well grown, but being subject to the apple scab, it needs a thorough spraying.

GREAT MOGUL.

Tree spreading, fruit large, oblong-flattish, greenish yellow in color. Rather shy bearer.

GERMAN CALVILLE.

Tree an upright grower, fruit large, greenish white. A handsome apple, but rather poor keeper.

GRANDMOTHER.

Makes an upright growth, fruit quite large, slightly conical, yellow, of good quality. season September.

HIBERNAL.

Hibernal is spreading in habit of growth, a great bearer of large even sized, handsomely colored fruit, which is very good for culinary purposes.

HIMBEER.

Tree spreading, fruit medium size, conical, early.

KIEV REINETTE.

Tree spreading, fruit large, flat, green striped in the sun.

KREMER'S GLASS.

Tree upright in growth, fruit large, yellow, quite acid until fully ripe, which is the last of July or the first of August.

LEAD.

Tree upright, fruit large, oblate, conical, yellow, with bluish in the sun. A good cooking apple.

LONGFIELD.

This is an annual bearer of medium to small size, yellow fruit, handsomely blushed in the sun.

MONEGI.

Tree an upright, somewhat spreading growth, fruit large, flat, striped, of very good quality.

MELONEN.

Melonen is an upright tree, fruit medium in size, oblong and slightly conical at both ends, delicately striped, and good for dessert.

OLDENBURG.

This variety is well known as the Duchess of Oldenburg. As a summer apple it holds a prominent place in the orchard.

PINK ANIS.

Pink Anis is an upright grower, fruit medium in size, conical and slightly striped in the sun.

PAINTED PIPKA.

Tree spreading, fruit large, conical, striped, an early apple of rather poor quality.

POSART'S NELIVIA.

Posart's Nelivia is an upright grower, fruit medium in size, oblong, flattish, white.

RED ANIS.

Tree spreading, fruit large, oblate-conical and red all over in the sun. Only medium in quality.

RED ASTRACHAN.

One of the most commonly grown and best known of our summer apples.

RED REPKA.

Spreading tree, fruit small, conical, and red in the sun. Of not much value either for dessert or market.

RED SPORT.

Tree upright in growth, fruit large, oblate, red, of fairly good quality.

RED STELLMAR.

Tree spreading; fruit medium in size, striped with red, early.

RED JUNGFERM.

Tree upright, of slow growth; fruit medium in size, oblong, conical, red. Only medium in quality.

RED QUEEN.

Tree spreading; fruit large, oblong, conical, striped, early.

REINETT.

Reinett is an upright spreading tree, fruit large, oblong, flattened. Yellow with a slight blush in the sun. Quality below the average.

RED TRANSPARENT.

Tree is a slow grower, spreading habit, fruit much the shape of the Yellow Transparent, but not so good in quality nor so attractive in appearance.

RED BEITIGHEIMER.

Tree spreading, fruit large, oblong-flattened, red, a poor keeper.

BOMNA.

Tree spreading, fruit medium in size, handsomely colored. Quality good for cooking.

ROSENHAGER.

A vigorous, spreading tree, fruit large, oblong, dark red and a late keeper, keeping well into the fall.

THALER.

Tree upright, somewhat spreading, fruit a little larger and later than Yellow Transparent, but in other respects much like it.

TITOVKA.

Tree somewhat spreading in growth, fruit medium to large, oblong-conical, very highly colored in the sun. More attractive in appearance, but not as good in quality as Benoni.

TETOFISKY.

An upright grower, fruit medium to small, striped, nearly red in the sun, early and of fairly good quality.

TYROLA TAUBEN.

The scions from which this tree was raised were received from Russia in 1888. The tree is an upright, somewhat spreading grower, fruit medium in size, and very pointed, unlike any other variety on the list, green, with slight blush in the sun, quite late keeper and quality only fair.

WINTER STRIEFLING.

Tree spreading in growth, fruit large, oblate-conical, striped, very handsome, and of fairly good quality.

I have already top worked a large number of these trees to other varieties, among them being 45 varieties, the scions of which were received from the Department of Agriculture and 20 varieties received from the State of Washington.

The list of plums and cherries remains the same as given in the report for 1896, and the notes given at that time will still apply.

EXPERIMENTS IN FORCING VEGETABLES.

JAMES TROOP.

In 1898 the first series of experiments were carried on in sub vs. surface irrigation of lettuce and tomatoes. The beds for tomatoes being four and one-third feet wide by 25 feet in length. One of these was lined with zinc, and a layer of soft brick, leaving a space of five inches above the bricks for soil. Water was applied from below. The other was five inches deep, filled with soil and watered entirely from the surface.

The beds for lettuce were of the same dimensions and arranged in the same manner, and the water applied as in the case of the tomatoes.

During the winter of 1899, the same beds were used and also an additional bed watered by means of a coil of water pipe punctured at intervals of 18 inches with small holes for the distribution of water which was forced through the pipes by means of a hose attached to a hydrant. While the results of this method were very satisfactory, they were not entirely so, the water not being distributed so evenly as in the case of the soft bricks. While the results of the first trial were decidedly in favor of the sub-irrigated plants, the results during the present season in the tomato test show a larger yield in ounces per plant as well as a larger number of fruits per plant on the surface irrigated bed. This holds true with both varieties used, viz: Lorillard and Stone.

In the experiment with fertilizers in varying amounts upon lettuce in the forcing house, the bed was divided into five plats, ordinary garden soil being used, and the following amounts of fertilizers used on each plat:

Plat 1.—One ounce nitrate of soda; two ounces acid phosphate; three ounces ground bone and one ounce muriate of potash.

Plat 2.—One ounce of nitrate of soda; two ounces of ground bone; one ounce of muriate of potash.

Plat 3.—Two ounces ground bone; one ounce muriate of potash.

Plat 4.—One ounce nitrate of soda.

Plat 5.—No fertilizer.

WEIGHT OF PLANTS FEBRUARY 12.

Plat 1.—59½ ounces.

Plat 2.—71½ ounces.

Plat 3.—63 ounces.

Plat 4.—64 ounces.

Plat 5.—60 ounces.

An accident to a single plant in plat 1 caused a falling off in the weight of that plat.

EXPERIMENT WITH FERTILIZERS ON PEAS, SOWED JUNE 10.

FERTILIZERS USED.

Plat 1.—Three ounces of nitrate of soda; six ounces ground bone; three ounces muriate of potash.

Plat 2.—Six ounces acid phosphate; six ounces ground bone; three ounces nitrate of soda.

Plat 3.—Three ounces muriate of potash; three ounces nitrate of soda.

Plat 4.—Without fertilizer.

AVERAGE HEIGHT OF VINES JANUARY 23, 1899.

Plat 1.—Nine inches.

Plat 2.—Eight and one-half inches.

Plat 3.—Eight and one-fourth inches.

Plat 4.—Eight inches.

WEIGHT OF PODS.

Plat 1.—Four rows, 17¾ ounces.

Plat 2.—Four rows, 22¾ ounces.

Plat 3.—Four rows, 17½ ounces.

Plat 4.—Three rows, 9¾ ounces.

WEIGHT OF VINES.

Plat 1.—Four rows, 22 ounces.

Plat 2.—Four rows, 22 ounces.

Plat 3.—Four rows, 19 ounces.

Plat 4.—Three rows, 8¼ ounces.

CORN SMUT.

J. C. ARTHUR AND WM. STUART.

GENERAL INTRODUCTION.

Every farmer in Indiana is thoroughly familiar with corn smut. It is a disease occurring to some extent wherever Indian corn is grown, in the old world as well as in the new; but it appears to be especially abundant and harmful in Indiana and some other middle western States.

Unlike the smut of the smaller grains, that of corn may show upon any and every part of the plant above ground. In estimates made in 1895 in fields of several acres near the Experiment Station the percentage of plants showing smut ranged from 5 to 12, as shown in table XXXIX with only between one and two per cent. of the ears destroyed. These figures appear to represent about the abundance of corn smut in ordinary years throughout the State.

This is for dent corn; sweet corn is usually more susceptible to the disease, although a late planted field of Stowell's Evergreen, near the Station, surrounded by fields of dent corn, proved to be very low in smut (see table XXXIX) in a count made in 1895. Reports have come to the Station a number of times regarding severe injuries to sweet corn, but it has not been possible to secure exact data. A correspondent in Northern Indiana recently wrote to us, saying: "We have a very early and choice kind of sweet corn, which we have been growing for several years; but during the last two or three years the smut has been increasing on the ears, until last year (1898) the corn was almost worthless." In Iowa, a loss of as much as two-thirds of a crop has been recorded.¹

Confining ourselves to the common field corn of this State, which is nearly always some variety of the dent group, flint corn being little grown, it may be stated with every likelihood of meeting the views generally held by farmers, that the smut of corn is a prevalent disease, that it causes some loss of the crop every year, that the loss is occasionally considerable, and that at all times its presence in the corn field is objectionable. If we assume that only one ear in two square rods is destroyed, it will mean a loss of about one per cent., which is probably a low estimate for the State, and especially low for some sections of it. Taking official statistics as a basis, the yield of corn has been a little over 30 bushels to the acre for Indiana (1887-1897), which may be fairly valued at 33 $\frac{1}{3}$ cents per bushel, or \$10.00 per acre; although it is to be remembered that in some of the more fruitful counties the returns are much larger than this. If we assume the low estimate of one per cent. of loss

¹ Bessey, Bull. Neb. Exper. Sta., No. 11, p. 17, 1889.

of ears by smut, it amounts to ten cents per acre, or a total of over \$375,000 a year on an average for the whole State. The real loss is probably twice as great as this, or more, at least for most years, but the intention is to use figures well within the actuality. To this estimate we must add the loss which comes from the weakening of the plants, and the consequent decreased yield when the smut develops upon other parts of the plant beside the ear, which is often doubtless considerable.

TABLE XXXIX.—PERCENTAGE OF SMUTTED PLANTS IN CORN FIELDS NEAR LAFAYETTE, IND., IN 1895.

	Late Planted Sweet Corn, Unmanured, Sept. 3.	Late Planted Dent Corn, Unmanured, Sept. 10.	Early Planted Dent Corn, Manured, Sept. 19.
Number stalks counted	5,000	4,647	2,482
Number stalks smutted	153	266	298
Percentage	3.06	5.72	12.01

Furthermore, some account is to be taken of the possible injury to stock from eating the smutted fodder. Altogether, from these facts, we may safely conclude that the farmers of the State will find it to their interests to examine this subject and take suitable precautions against the pest.

There is but one kind of corn smut occurring in the State, although other kinds are known elsewhere. It makes its appearance on any part of the plant above ground, from the time the plant is six inches high to maturity, but is most noticeable and injurious when in the ear. The disease first shows as a swelling that becomes pale and watery as it grows, and is soon covered with a thin, white membrane. As the spores begin to ripen, the interior becomes blackish, and finally the whole mass turns to a black powder, loosely held in place by a small amount of fibrous material. The smut masses, or pustules, range from an inch or two in diameter on stalks, leaves and tassels, to six or eight inches in diameter, being largest on the ears.

The smut disease is due to a parasitic fungus, whose thready growth ramifies among the tissues of the corn plant, absorbs its sap, and through irritation of the parts causes an abnormal pustular development. When the fungus matures it is almost wholly converted into innumerable spores, individually microscopic, but together forming quantities of a greasy black powder. These powdery spores propagate the disease from year to year.

INITIAL EXPERIMENTS TO PREVENT SMUT.

The prominence of corn smut early induced the Botanical Department of the Station to examine into the probability of discovering some pre-

ventive or palliative remedy for it. From the general similarity of the smuts of oats and wheat to that of corn it was a natural inference, afterward found to be entirely fallacious, that what would prevent smut in the small grains would also do so in corn. Therefore, when the Jensen hot water method for preventing cereal smut was being studied, its application to corn was also thoroughly tested.

TABLE XL.—TREATMENT OF SEED CORN WITH HOT WATER TO PREVENT SMUT.

TREATMENT.	PLANTED MAY 14, 1891.			PLANTED MAY 25, 1891.		
	Total No. of Plants.	No. of Smutted Plants.	Per Cent. of Smut.	Total No. of Plants.	No. of Smutted Plants.	Per Cent. of Smut.
Sum of controls	1,408	148	10.51	1,499	49	3.27
51 C. (125 F.) 5 min	128	17	13.28	81	1	1.23
51 C. (125 F.) 10 min	121	19	15.70	80	2	2.50
54 C. (130 F.) 5 min	135	15	11.11	84	4	4.76
54 C. (130 F.) 10 min	127	16	12.59	80	4	5.00
57 C. (135 F.) 5 min	125	8	6.40	83	1	1.20
57 C. (135 F.) 10 min	120	9	7.50	84	0	0
60 C. (140 F.) 5 min	127	14	11.02	82	3	3.66
60 C. (140 F.) 10 min	123	15	12.19	82	5	6.09
63 C. (145 F.) 5 min	121	17	14.05	82	4	4.88
63 C. (145 F.) 10 min	81	8	9.88	51	1	1.96
66 C. (150 F.) 5 min . . . . .	..	..	..	161	5	3.11
66 C. (150 F.) 10 min . . . . .	..	..	..	39	1	2.56
69 C. (155 F.) 5 min	90	7	7.78	76	1	1.31
69 C. (155 F.) 10 min	26	2	7.69	25	0	0
71 C. (160 F.) 5 min	3	0	0	12	4	33.33
74 C. (165 F.) 5 min	1	0	0	0	0	0

The supposition was that if smut in oats and wheat could be prevented by treating the seed grain to a bath in hot water at a temperature that would kill the smut spores and leave the grain uninjured, the same could be done with corn, and that it only needed a series of experiments to ascertain the required temperature. Although it was afterward found out that this procedure was futile in the case of corn, because the fungus never gains entrance to the plant from spores attached to the seed planted, but from spores blown through the air, yet it is thought best to record some of the data of these experiments in order to convince persons who may still be skeptical regarding the finality of the conclusions. Table XL gives the results of two experiments conducted in 1891. The corn selected was an early yellow dent variety, part of the seed used on the Station farm, and not more contaminated with smut than the average crop of the region. The seed was enclosed in muslin bags and held in water at different temperatures ranging high enough to exceed the death point for corn. Although no tests of the death point for the smut spores have been made by this Station, yet from subsequent researches con-

ducted in Iowa,² it is certain that the range selected for the experiments exceeded the death point for the smut, and furthermore exceeded that for corn. The ground used for the experiment had not been in corn for several years. The smutted stalks were counted on August 18 and 19. A study of table XLI will show, we think, that the planting of seed free

TABLE XLI.—SUMMARY OF TREATMENT OF SEED CORN IN 1891 WITH HOT WATER.

	1st Planting, Per Cent. Smut in the Crop.	2d Planting, Per Cent. Smut in the Crop.
Untreated seed	10.51	3.27
Treated with hot water.	11.07	3.27

from viable smut spores did not in the slightest degree reduce the amount of smut in the crop. As nearly the whole range of treatment was above the death point for the smut spores, we may fairly contrast the results from the treated and the untreated portions. In the first planting 11.07 per cent. of the plants developed smut in the treated portion and 10.51 per cent. in the untreated; in the second planting 3.27 per cent. showed smut in both the treated and untreated portions; that is, there was no appreciable difference between them.

It was also found by trial in 1891 that seed corn taken from stalks which were infested with smut, but not in the ear, gave a crop no freer from smut than corn from stalks harboring no smut. (See Table XLII.)

TABLE XLII.—SEED FROM SMUTTED STALKS AND CLEAN SEED WITH SMUT SPORES APPLIED, 1891.

SOURCE OF SEED AND TREATMENT.	TOTAL NUMBER OF PLANTS.		NUMBER OF SMUTTED PLANTS.		PER CENT. OF SMUT.	
	Planted May 14.	Planted May 25.	Planted May 14.	Planted May 25.	Planted May 14.	Planted May 25.
Seed from stalks free of smut, untreated	123	76	20	0	16.26	0
Seed from stalks free of smut, 69° C., 5 min.	98	75	10	0	10.20	0
Seed from stalks with smut, untreated	135	87	22	5	16.29	5.75
Seed from stalks with smut, 69° C., 5 min.	90	71	14	2	15.56	2.82
Seed in water, 69° C., 5 min., then coated with spores	92	131	10	8	10.87	6.11
Seed in water, 69° C., 10 min., then coated with spores	. . .	31	. . . . .	5	. . .	16.13

² Stewart, Proc. Iowa Acad. Sci. for 1891, 2: 76. Spores of corn smut immersed in water for fifteen minutes lost their power of growth at 52° C. and above, and corn under same conditions did not germinate from 71° C. upward.

It was further ascertained at the same time that the amount of smut in the crop could not be increased by sowing smut with the seed. The seed in this case had a mass of spores applied to the germ side of the kernel before planting, and made to adhere by moistening with starch paste.

Another trial was made in 1895 to control the smut by treatment of the seed, and with the same results as before, as may be seen by examination of table XLIII. In this and in the former trial it seemed as if the hot water treatment of the seed encouraged the smut, rather than decreased it. In the 1895 experiments an attempt was made to put the question of the infection of the seed beyond all doubt by applying spores in a germinating condition. A Pasteur sugar solution, well thickened with smut spores, some of which had begun to grow, as shown by the microscope, was used to coat the kernels of corn before planting. It was somewhat sticky on account of the sugar, and adhered well to the grains. The record shows (table XLIII), that under the most perfect conditions we could devise, no evidence of infection followed.

TABLE XLIII.—TREATMENT OF SEED IN ORDER TO INCREASE OR DECREASE SMUT IN THE CROP.

TREATMENT OF SEED.	No. of Plants.	No. Plants Smuted.	Per Cent. of Smut.
Untreated	335	47	14.0
1 pound copper sulphate in 15 gallons water for ½ hour .	295	41	13.9
Ammoniacal cupric carbonate for one hour	253	27	10.5
Water at 60° C. (140° F.) for five minutes	287	42	14.5
Pasteur solution containing germinating corn smut spores	268	36	13.4

When we take into account the ineffectual attempts to infect the corn plant with smut through the planted seed, and the equally ineffectual attempts to secure disinfection by treating the seed with fungicides, there can remain no doubt that smut attacks corn in some other way than through the seed or seedling. Others³ have tried similar experiments, of which the best known are probably those conducted at the Wisconsin Station in 1883⁴.

³ Henry, Rep. Board of Regents Wis. Univ. for 1881; 46-54. 1882. Satterlee, Mich. Agr. Rep. for 1883; 45. 1894. Pammel, Proc. Iowa Acad. Sci. for 1891, 1; (Pt. 2) 95. 1895 and Bull. Iowa Exper. Sta. No. 20; 726. 1893. Buckout, Rep. Penn. Exper. Sta. for 1891; 179-180. 1892. Kellerman, Bull. Kas. Exp. Sta. No. 23; 101. 1891. Georgeson, Bull. Kas. Exp. Sta. No. 30; 202. 1891. Goff, Tenth Rep. Wis. Exp. Sta. for 1893; 246. 1894. Halsted, Rep. N. J. Exper. Sta. for 1896; 352. 1897. Selby & Hickman, Bull. Ohio Exper. Sta. No. 78; 92. 1897. Thomas, Proc. Ind. Acad. Sci. for 1898; 62-64. 1899.

⁴ Henry, First Rep. Wis. Exp. Sta. for 1883; 25-27. Seed was prepared in three ways, with copper sulphate, and with carbolic acid, and with smut spores placed in the hill with the seeds. There was no apparent effect upon the amount of smut in the crop.

These details and results of experiments have been recorded in order to impress the reader beyond the probability of forgetting, that unlike the case of oats and wheat, corn smut can not be reached by treatment of the seed.

EXPERIMENTS OVER A HUNDRED YEARS AGO.

Among the earliest references to the subject of corn smut is the record of studies and experiments by Tillet⁵, who, in 1760 and 1761, made a careful investigation of the disease in the fields of Angoumois, a province in southwestern France. The wheat fields of that region had been devastated by insects, and two members of the French Academy had been designated to look into the matter. They were the distinguished botanist and forester, DuHamel, a man of 60 years of age, and author of a number of important treatises, and Tillet, a much younger man. The study of corn smut was an unexpected side issue. But both men were readily interested in the subject, for DuHamel had already called the attention of others to it, and Tillet five years before had published a hundred and fifty page work on the cereal smuts. After a preliminary survey, DuHamel returned to Paris and left the field work to his younger associate.

It seems strange in this day to read in Tillet's report to the French Academy the grounds on which he thought it necessary to apologize for giving attention to such a matter. "I admit," he says, "that the corn or Turkey wheat, a disease of which I am about to describe, is not often cultivated except for animals, but it frequently happens that want or poverty compels the peasants to seek nourishment from it; and is it not a good idea to give attention to this kind of grain, since it contributes to the sustenance of a portion of the people that the government itself holds an interest to preserve?" He continues in this conciliatory strain by saying that the peasants rarely use any of the wheat they raise, "being too precious for them;" and we wonder at the changes that a hundred and forty years have wrought. Late statistics show that in the year 1898, the United States have produced 2,000 million bushels of corn, against 675 million bushels of wheat, with a prospect of these figures being exceeded in the present year of 1899, and that the corn had much the greater value in money and in general utility. Every one eats wheat now, even the poorest, and also every one eats corn, even the richest. Furthermore, vegetable pathology no longer needs defense, and men of learning under the direction of the government may openly devote themselves to the study of plant diseases even in cases where no practical advantage is clearly observable.

Tillet gives a very graphic account of corn smut, which would apply in every detail to the appearance of the disease as we know it in our fields to-day. But it is Tillet's experimental studies that stand out most

⁵ Mem. et Hist. Acad. Sci. for 1760; 85-89, 254-261.

prominently; they were so well devised and so conclusive that had we read the account there would have been no need for the work which has been tabulated and summarized above, except as confirmation; the problem had been settled 138 years ago. It must be borne in mind that the stinking smut of wheat was at that time well known to be due to the spores that adhere to the seed grain, and the practice was common among farmers to treat the seed with some solution to remove or kill the spores. This knowledge was the basis for work on corn smut. The account may best be given to some extent in the words of Tillet,* as closely as an English rendering premits.

"To the house where I lodged in Rochefoucault was attached an ample garden, very well exposed, the soil of which was good, and where there was a small piece of fine wheat, while another part was planted to legumes or bore fruit trees. I enclosed a small piece in a corner of this garden, in order to perform some experiments I had in mind. I divided it into three plats or strips, each of which was about six feet wide by eighteen feet long; they were separated by a path two feet wide, and each plat was marked off the longest way into seven rows, one foot apart."

In the first eleven of these twenty-one rows he planted kernels of corn that "he had kept for a long time in the black dust with which the excrescences, caused by the disease, are filled; these grains were so well covered with the dust, that when they were planted some of it fell off and lay in the bottom of the furrow where the germ would develop." The next four rows were planted with corn "which at first had been thus inoculated, but which I had washed before planting in a lye-wash that I had made from dissolved lime, as it is the custom of practical men to-day in the preparation of their wheat. The next row was planted with kernels from the tip of ears where they were black and seemed to indicate a beginning of the disease. Three more rows were planted with sound grain, to which I had given no treatment. Finally the two remaining rows were planted with corn that "came from an ear partly sound and partly spoiled."

In connection with this carefully planned experiment, he instituted another by selecting from a field not far away young corn plants "that appeared to me the feeblest, or those which were darker in color than the others," as indicating some tendency toward the disease. These were transplanted to his garden, and by watering were but slightly checked in their growth.

The results were not at all what were expected. "I have constantly kept my eyes upon the plants which were in my experiment," he says, "and I have taken occasion every day to go into the open fields to make comparison with those which I have just examined. I carefully observed in scrupulously visiting each of the plants, the least alteration or the most trifling blemish that could be found, in hopes that some one of them would

* Tillet, *Hist. de l'Acad. roy. des Sciences*; année 1760; 258. Paris, 1766.

aid me to detect the beginning of the disease." And yet he says, "I did not notice the slightest protuberance in the large number of plants that my three plats contained; and among those that were transplanted only one plant bore on the midrib of one of its leaves a beginning of the disease." Even this one protuberance made but a slight development, and proved abortive.

No fault can be found with these experiments; they were as well planned and executed as if performed by a modern experiment station. But the conclusions drawn by Tillet and subsequent writers were wholly unwarranted. "Therefore," he says, "it appears from these experiments that the black dust into which the excrescences are converted is not contagious, and that the kernels of corn with black tips that have begun to change do not contain the principles of the disease." The opinion of this experimenter was adopted by many writers, the leaders undoubtedly being Beckman⁷ of Gottingen, Imhof⁸ of Strassburg, and Parmentier⁹ of Brussels, and thus became a part of cyclopedic knowledge.

What the experiments of Tillet did prove was that the smut disease of corn is not transmitted through the seed or seedling; but as he had asserted that it was not transmitted by the spores, an entirely unwarranted and false conclusion, it was necessary to furnish some other explanation of the phenomenon. Although some writers, including DuHamel, ascribed the swellings to the stings of insects, yet Tillet opposed this view on good grounds, but thought them due to "a too great abundance of sap, which in rich land is carried toward certain portions of the plant, with much more force than demanded by the natural texture of the plant, and causes an excessive dilation in the utricles or cellular tissue of the parenchyma." He thought it was a physiological disease, not a parasitic one. The excessive sap theory was largely accepted for many years, and it would not be difficult to find advocates for it even now.

EARLIEST MENTION OF CORN SMUT.

Corn is a native of America, probably of Mexico. The explorers of America found it in cultivation by the natives over a territory extending to the LaPlata river in South America and far northward in the United States. It was probably introduced into Europe shortly after the discovery of the new world by Columbus. Spanish records¹⁰ show that corn was sent to Seville as early as 1500; and it was doubtless rapidly disseminated, although not extensively cultivated, for it is mentioned by many authors in the first half of the 16th century.

It would seem that excrescences so conspicuous and peculiar as those

⁷ Hannoverisches Magazin 6; 1339. 1768.

⁸ *Zea Maydis morbus ad Ustilaginem vulgo relatus*; 12. Argentorati, 1784.

⁹ *Le mais ou blé de Turquie*, Mem. Acad. Bordeaux. 1786.

¹⁰ DeCandolle, *Origin of Cultivated Plants*; 390.



A.

Smutted Corn Plants.

B.

A shows four pustules of smut, each at a node of the stalk. The smut has attached the stalk at the base of each joint. Inside the sheath, and after a time the pistole has become so large as to burst the sheath.
B shows a large pustule at the uppermost node of the stalk, which, instead of bursting the sheath, has pushed the sheath bearing about over to one side. At the same within the upper sheath, was a smaller, but similar, one.

of the smut disease of corn would attract the attention of writers, and yet this is offset by the fact that early writers were not likely to attach much importance to the abnormal growths of plants. The earliest American record of the disease we have found is by Schweinitz¹¹ in 1822, who was in fact the first North American botanist to systematically collect and record fungi occurring in the United States. It is briefly described in technical characters in his list of the fungi of North Carolina. Roulin¹² in a memoir upon the physiological action of corn smut, presented to the French Academy in June, 1829, says that he had observed this malady of corn during a sojourn in South America. No other references to the disease in this country have come to light antedating 1850.

The very earliest record of corn smut appears to be by the French botanist Bonnet¹³ in 1754, in his treatise on the function of leaves, who notes that "although it is classed with the smuts of other cereals, it produces effects altogether different, and unlike the others, it occurs on all parts of the plant." He mentions having received a letter from DuHamel in December, 1752, in which corn smut is spoken of; but he says that no reference to it was to be found in DuHamel's publications up to the time of his own book.

The second writer to publish something relating to corn smut was Aymen,¹⁴ a corresponding member of the French Academy of Sciences, who described it briefly in 1760, as if no new thing. Again, in 1763, he¹⁵ takes up the matter more fully, and details observations made by himself in 1752. In 1766 the influential writings of Tillet were published, founded on observations made in 1760 and 1761, already cited, followed after a time by the comprehensive and scholarly treatise by Imhof, also cited above.

These authors furnished the foundation for all subsequent writings upon the subject in France and in other countries, and also gave direction to some extent to the views of the uneducated. It will be seen that the earliest mention of corn smut in European literature is at least 150 years subsequent to the introduction of corn into Europe, and in American literature it is three-quarters of a century later. There is every reason to suppose that on both continents corn smut had existed, and even become common long before the time when it found mention in printed records.

¹¹ Schweinitz, *Synopsis Fungorum Carolinae Superioris*, *Schriften d. nat. Ges.* 1; 71. 1822.

¹² Roulin, *De l'ergot du Mais, et de ses Effets sur l'homme et les Animaux*. Acad. Sci. 1829. Quoted by Duchesne, *Traite du Mais*; 64.

¹³ Bonnet, *Rech. sur l'usages des feuilles*: 327-330.

¹⁴ Aymen, *Recherches sur les progres et la cause de la nielle*, *Mem. de Math. et Phys.* Acad. Sci. 3; 77. Paris, 1760. (Sometimes cited from the imprint at the bottom of the signatures; *Sav. etrang.*)

¹⁵ Aymen, *Second Memoire sur les maladies des bles*, same, 4; 361. Paris, 1763.

THE LATIN NAME OF THE FUNGUS.

When searching the literature of the subject for information that would influence the course of our investigations, it was noticed that considerable diversity existed regarding the form of the Latin name for the fungus. In order to settle the question of the correct name, search was made through the early literature, especially in the libraries of the Universities of Bonn and Berlin, and more successfully in that of the British Museum. The conclusion and principal data have already been presented in an article in the Botanical Gazette¹⁶ and only the more interesting points call for notice here. The object has been to find the earliest Latin name used in connection with a description identifying the fungus, which by rights, and in accordance with rules now generally followed by botanists, should be recognized as the correct name.

Two prior attempts had been made to ferret out the true name. In 1881 George Winter¹⁷ in revising the fungi of Rabenhorst's cryptogamic flora of Germany decided that DeCandolle had first published the name in 1806, which he construed as *Ustilago Zeae-Mays* (DC.) Wint. Again, in 1895, Magnus¹⁸ of the University of Berlin, while studying the introduction of corn smut into central Germany, found an earlier name by De Candolle (1805), which gave the form *Ustilago Mays-Zeae* (DC.) Magn.

In our own search through the literature, a much earlier name than either of these has been found, and one to which no valid objection seems applicable. It was given by Beckmann¹⁹ in a supplemental footnote to the translation of Tillet's paper before the French Academy already abundantly cited which he furnished to the Hanoverian Magazine for October 1768. Beckmann was a distinguished professor of economics in the University of Gottingen author of the "Principals of German Agriculture," which passed through a number of editions of a cyclopedia of agriculture, and of numerous other papers and articles upon agricultural topics, as well as of a botanical dictionary. Subsequently a new genus was established for those smuts with which that of corn is still associated, and Beckmann's name was first used under this genus of *Ustilago*, by Unger²⁰ in his work on soils as influencing plant distribution. The name as it should now stand, is therefore *Ustilago Zeae* (Beckm.) Ung.

This name is not the one, unfortunately, which has been used heretofore by writers. The form has most often been *Ustilago Maydis*, which has usually been credited to Corda, but not infrequently to DeCandolle, Tulasne or Leveille, all botanists of note, who made important contributions to the subject of smuts. As a matter of incidental interest the fol-

¹⁶ Arthur, The Common *Ustilago* of Maize, Bot. Gaz. 23; 44-46. January, 1897.

¹⁷ Winter, Rabenhorst's Krypt.-Flora von Deutschland, 1; 97. 1881.

¹⁸ Magnus, Seit wann ist der Maisbrand in Mittel Deutschland? Deutscher bot. Monatschr. 13; 50. 1895.

¹⁹ Beckmann, Hannoverisches Magazin. 6; 1330. 1768.

²⁰ Unger, Einfluss des Bodens; 211. 1836.

following list of Latin names, applied at various times to corn smut, has been compiled, together with the citation of the works in which they were first published. The list may not be complete.

USTILAGO ZEAÆ (Beckm.) Ung.

SYNONYMS.

- 1768 Lycoperdon Zeae Beckm., Hanov. Mag. 6:1330.
- 1805 Uredo segetum Mays-Zeae DC. Fl. France 2:596.
- 1808 Uredo Zeae-Mays DC. Encyc. Meth. Bot. 8:227.
- 1815 Uredo Maydis DC. Fl. France 6:77.
- 1822 Uredo Zeae Schw. Schriften d. nat. Ges. 1:71.
- 1825 Caeoma Zeae Link, Linne Sp. Plant, 2:2.
- 1833 Erysibe Maydis Wallr. Fl. Germ. :215.
- 1836 Ustilago Zeae Ung. Einfl. d. Bodens :211.
- 1842 Ustilago Maydis Cda. Icon. Fung. 5:3.
- 1847 Ustilago Schweinitzii Tul. Ann. Sci. Nat. III. 7:85.
- 1881 Ustilago Zeae-Mays Wint. Rabh. Krypt. Fl. 1:67.
- 1895 Ustilago Mays-Zeae Magn. Deutsch. Bot. Mon. 13:50.

It is somewhat significant that the list is headed by Beckmann, a man whose interests were almost wholly on the practical side of the subject, and that he was closely following Tillet, who made his studies as a government expert working on the economic phase of the matter.

HISTORICAL PERIODS IN STUDY OF THE DISEASE.

In attacking the subject from the practical side, three periods in the history of investigation are to be recognized, dependent upon the dominant views regarding the nature of the disease and its mode of propagation.

The first period (1754-1832) extended from the earliest observations, those of Bonnet, Tillet, Aymen and Imhof, well toward the middle of the nineteenth century, or to be exact, to the publication of DeCandolle's important work on vegetable physiology. Although during all of this time systematic botanists classified corn smut as a fungus, yet vegetable pathologists and practical observers treated the disease essentially as an edema. They believed that it was due to the excessive accumulation of sap in parts of the plant, causing lesions in which the sap and tissues degenerated into a black mass that finally dried into a powder. The conclusion was based upon inability to propagate the disease with the smut powder (spores), and the observation that it was most abundant upon plants in rich and damp soils, and was promoted by moist atmosphere and close planting. Bonnet, DuHamel and others thought that the swellings were incited by the sting of some minute insect, and a few writers believed them to be spontaneous abnormalities. The views of the period are briefly stated by Bonafous²¹ in his memoir on maize.

²¹ Bonafous, Histoire naturelle, agricole et économique du Maïs: 94-99. Paris, 1836.

Translation of the part here referred to is given by Hitchcock and Norton, Bull. Kas Exper. Sta. No. 62: 192-194. 1896.

For the agricultural practice, the closing words of Tillet's communication to the French Academy summarized the matter from the farmer's standpoint. He said that his studies showed that although they had good grounds for being afraid of wheat smut because of its contagiousness, yet they need not fear corn smut on that account, and if the disease is abundant one season, they need not in consequence be apprehensive of an increase of the disease the next season. Other writers during this period advocated cutting away the smut pustules. This was not to stop the spread of the disease, but to prevent the swellings from drawing the sap away from the ear and checking its development.

During the first period both belief and practice were erroneous, and were based on wrong deductions from imperfect knowledge.

The second period (1832-1895) extended from the time when De Candolle's authoritative opinion²² became dominant until the researches of Brefeld, a German botanist still engaged upon studies of this nature, were published to the world.²³ During this period the disease was recognized as of parasitic origin, and due to the attack of the smut fungus. But the propagation of the disease was supposed to closely follow the fairly well understood course of the oat and wheat smuts. Brefeld said in his preliminary announcement to the Berlin Agricultural Club that "at the time of my first series of experiments in the year 1885, I still held to the old view, universally current, that smut germs generally could penetrate only into the young seedlings in order to appear later as smut masses in the full grown plant, and that consequently, a penetration of the germ into the plant when it had passed the seedling stage was not possible." It required an investigator of the highest ability to break away from such firmly fixed beliefs, and to devise an entirely new course of experimental procedure, an honor belonging exclusively to Brefeld.

Very important advances were made in a knowledge of the fungus during this period. The able botanists who contributed most toward the development of this part of the subject (together with the dates of their most serviceable contributions) were doubtless Meyen (1838), Leveille (1839), Tulasne brothers (1847), DeBary (1853), Kuhn (1858 and 1874), Fischer von Waldheim (1869), whose memoir has been rendered into English, and Brefeld (1883). By the aid of improved microscopes, the course of the fungous mycelium inside the corn plant and the development of

²² De Candolle, *Physiologie Vegetale* 3: 453. Paris, 1832.

²³ The preliminary publication of Brefeld's work upon artificial infection of the corn plant with the smut parasite was presented to the Agricultural Club of Berlin in 1888, but it was not until 1895 that his extensive researches upon the question were completed and the record made available. The citations are as follows: Brefeld, Oscar, *Neue Untersuchungen über die Brandpilze und Brandkrankheiten*. Nachr. a. d. Klub der Landwirthe zu Berlin, 1888: 1577-1584, 1588-1593, 1598-1601.—Abstracts in Gard. Chronicle, 1888: 396-397; Bot. Centralblatt, 39: 15-18, 1889, and full translation by E. F. Smith in Jour. Mycology, 6: 1-8, 59-71, 153-164. 1890-91,—Brefeld, *Die Brandkrankheiten des Getreides*, Unters. a. d. Gesamtgeb d. Myk., Heft 11: 52-92, pl. 2-5. Munster, 1895.—Abstracts in Bot. Centr., 64: 273, 281, 1895; Hedwigia, 34: 138-140, 1895; Amer. Nat., 30: 137-142, 1896.

the spores were followed; the germination of the spores was accomplished in 1857 by Kuhn who found that they germinated with difficulty or not at all in pure water and later (1874) he observed the penetration of the germ tubes of the fungus as they pierced the epidermis of the corn plant. Brefeld in his first important memoir upon smuts made a highly valuable contribution to the subject by showing that the corn smut spores would germinate with great readiness in nutrient solutions, and would even carry on an independent growth for a long time, forming great numbers of secondary spores, quite unlike those formed on the corn plant.

But all this information regarding the fungus led to no serviceable theory or practice in the prevention of the disease. Many were the vain attempts to prevent the smut by various applications to the seed. Kuhn, the most practical man among the many investigators, advocated the treatment of the seed with copper sulfate, and naturally was followed by others writers, until the method became current in standard works;²⁴ while all suggested the gathering of the smut in the fields and burning it, as a good general practice without knowledge of the specific reasons.

The third period opened with the brilliant researches of Brefeld, who completed our knowledge of the etiology and propagation of the disease by showing that the corn plant was open to infection at whatever point of its surface above ground the tissues were soft and still actively growing; that the disease was narrowly local in its action on the host, and that the infection was not by means of the black smut spores, but by colorless secondary spores produced aeriaily from saprophytic growth of the black spores.

Brefeld's work essentially completed our knowledge of the life history of the fungus and the course and propagation of the disease, only leaving for further study a verification of the main facts, extension of details, and devising of preventives.

THE SPORES AND THEIR GERMINATION.

The masses of corn smut, often as large as one's head are mostly composed of a blackish powder, which is in reality, a wonderful collection of the minute spores of the fungus, countless and almost inconceivable in number. Under the microscope the powder looks like small, very small, balls, almost or quite round and covered over thickly with minute projecting points.

Each of these exceedingly minute globular grains of dust is capable of growth, if in sufficiently moist and fertile surroundings. It was formerly thought that the spores were only able to cause infection after they had passed a winter, and another warm season had begun. But this is an error. We have found that spores taken as early as the middle of July from corn plants in the field germinated within twenty-four hours

²⁴ Cf. Plumb, *Indian Corn Culture*: 161. Chicago, 1896.

after removing them from the pustule. They are in fact viable, and capable of starting infection from the time they are fully formed in the moist smut bunches until after a year or two, or possibly much longer, of the varying fortunes of refuse matter they cease to be alive.

The most significant observation, leading to recognition of the widely different physiological behavior of corn smut in contrast with the better known cereal smuts, was made by Brefeld, when he found that the spores which would not grow in pure water would make ample and characteristic development in nutrient fluids (Fig. I, a, b). In such fluids, of which the

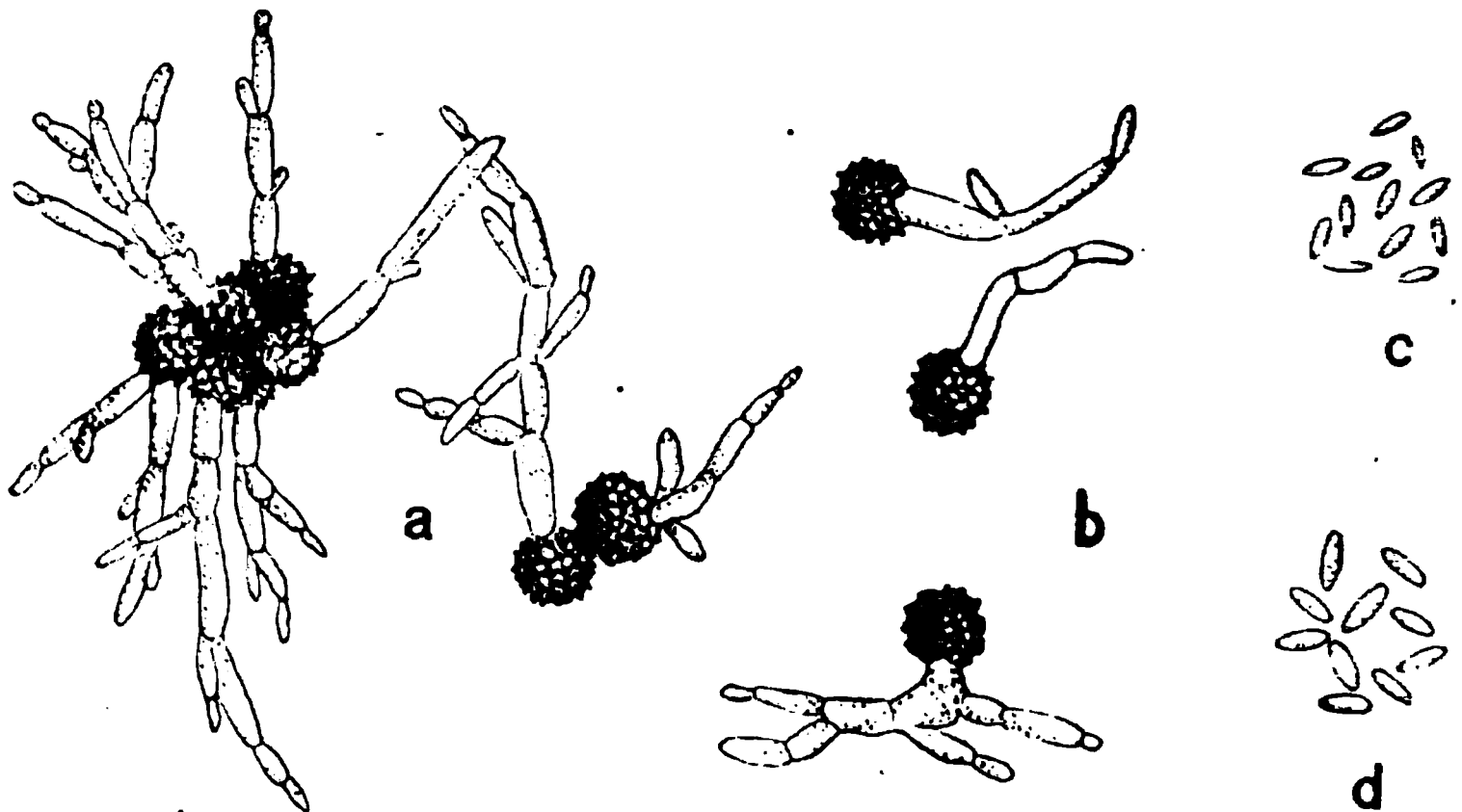
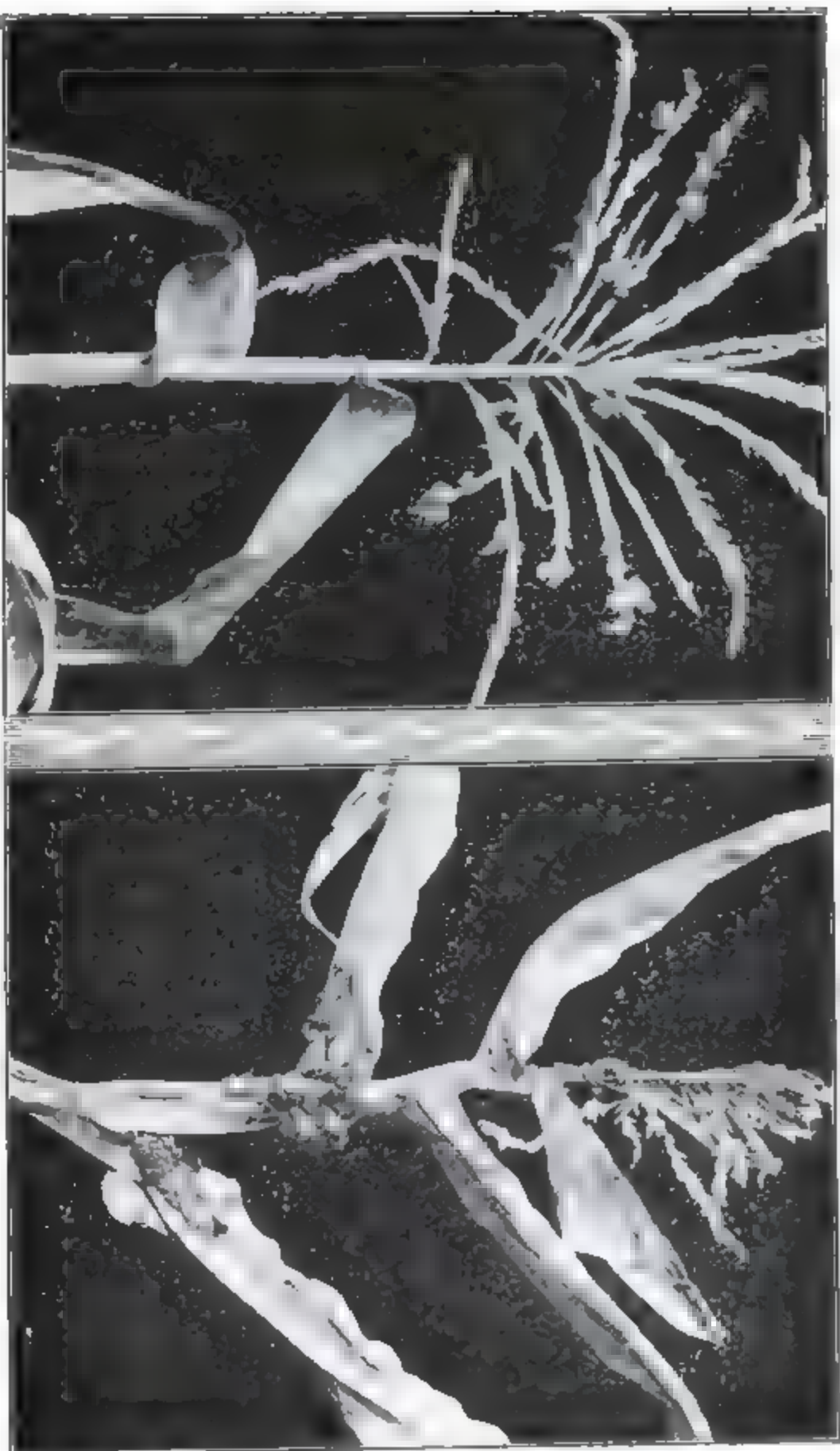


Fig. 1. Germinating spores of corn smut and the resulting conidia. a, two groups of smut spores showing mold-like growth after 36 hours; b, three smut spores after having grown 18 hours; c, conidia formed in the air, which are the chief means of infection of corn plants; d, conidia formed in liquid, somewhat larger and plumper, but otherwise like the air conidia.

liquor from barnyard manure was one of the best, the spores not only made a growth, but developed great numbers of thin-walled, colorless, secondary spores, of uniform size and shape, in every way unlike the black smut spores, and from their appearance evidently serviceable for greater multiplication of the disease, as was afterward proved by experiment. From their nature such spores are known to botanists as conidia (Fig. 1. d.) Brefeld determined by experiment, and the observations have been repeated in our own work and also by others, that the black smut spores do not directly cause infection by growing into the corn plant, but after growing, as a mold grows, the conidia thus formed are able, when placed on the surface of young tender parts of the corn, to pierce the plant by means of a germinating tube, the infection leading to the production of smut masses at that place.

But the crowning discovery of Brefeld, which completed our knowledge of the essential features in the life history of the fungus and of the



A.

SMUTTED CORN TASSEL.

B.

A shows many pustules of smut developed on the staminate flowers.

B shows an accumulation of smut pustules on parts of the upper leaves where moisture was held for a time just previous to appearance of the tassel. The growth of the tassel was checked by the smut.

etiology of the disease, was announced in his memoir of 1895. He found that the growth from the black spores produced conidia in the air whenever possible, rather than beneath the liquid (Fig. I. c.). This now made Kuhn's observation of 1857 significant, that the spores germinate better in moist air than under water. In fact, it appears certain, without going into the details of experiments and studies which substantiate the deduction, that the corn smut disease is largely, possibly wholly, propagated by the conidia borne through the air from the growing black spores as they lie on the ground in barn yards, pastures and fields, and especially wherever decomposing vegetable matter provides extra nutriment.

In our own work spores were grown in such liquid media as beef bouillon, expressed corn juice, wort, Pasteur solution with and without sugar, and both hydrant and distilled water, and in such solid media as gelatin, agar-agar and starch paste. Of these the Pasteur sugar solution and agar-agar proved the most satisfactory. Excepting in clear water the spores usually germinate in eighteen to thirty-six hours. The growing spores and air conidia are shown in Fig. I.

In studying germination and testing vitality in the Station laboratory, the spores were sown in a hanging drop, but in providing material for infection experiments upon growing corn plants the spores were sown in test tubes with both solid and liquid media.

STUDY OF AERIAL INFECTION.

The first successful infection experiment was conducted by Julius Kuhn of Halle in 1874; but as only a single seedling plant out of many trials showed disease, and as the methods employed as we now know, were not well adapted to corn smut infection, although suitable for some cereal smuts, it must be regarded in the nature of an accident. No other attempts at infection of the corn plant were successful until Brefeld began his fruitful studies (1885-87), with an entirely new hypothesis regarding the mode of propagation. Brefeld used for infecting material nutrient solutions containing a large quantity of conidia developed from the growth of smut spores, which he sprayed over the part of the plant where he hoped to produce the disease. The same method has been successfully employed by subsequent workers.

After many failures, due to a lack of appreciation for all the needed details of manipulation, successful experiments in infection were performed at the Indiana Station during the winter of 1897-98. For this purpose black smut spores were sown in test tubes of nutrient media, usually a Pasteur sugar solution, and when air conidia were abundantly developed the contents of the tube were thoroughly mixed and used as infecting material.

The plants for the first successful trial were started between folds of moist cotton cloth, the ordinary form of Geneva germinator being used.

When the radicles had attained one or two inches and the leafy stem about one-half inch in length, they were subjected to the infecting material in form of a fine spray. After remaining in the moist cloths of the germinator twenty-four hours longer, they were transplanted to soil in pots and boxes, and placed in the greenhouse.

Of nine corn seedlings infected at this time, December 4, 1897, six showed signs of the disease in eleven days. The tips of the young leaves were especially attacked, and the blades and stems to a less degree. Three of the six diseased plants lived to develop well defined smut pustules, which took about two weeks from the time of spraying, but all finally died from the debilitating effect of the disease. Four of the plants of this experiment are shown in Plate XIII, the one diseased plant being stunted and bent to one side by the pustules at its base, in marked contrast to the three healthy plants.

Another trial of the same kind was begun on February 11, 1898, by spraying as before four corn plants growing in small pots. The conidia were applied to the top of the plants just as the first leaves were unfolding. One of the four plants showed infection (see Plate XIII), developed pustules at its base, and was distorted and weakened in the same manner as those of the previous experiment.

In this country successful attempts at artificial propagation of the corn smut disease have been carried out at the Kansas Station² in the open field and at the Illinois Station, the latter not yet published.

The American studies show some of the conditions for effective propagation of the disease clearly enough, but we must turn to Germany, and particularly to the luminous work of Brefeld, to fully appreciate the behavior of corn smut in the open field. The facts appear to be that under ordinary conditions the conidia are the bearers of the disease. The conidia are minute, colorless and short lived sporidia, and are produced in the greatest profusion whenever the black smut spores find the necessary warmth, moisture and nutriment for their mold-like growth, which are provided at any time during the summer by damp, rich soil. As the conidia are borne through the air, which must be rather moist or they will be killed by drying, they come in contact with corn plants, and if there is the right amount of moisture present, each minute conidium sends out a slender tube that pierces the surface of the plant, provided it is young and tender enough at that point, and sets up the disease within. Any part of the corn plant above ground may in this way become affected with smut, but only during the time that it is still tender and growing. The leaves, stems, especially the nodes, brace roots, tassels and ears may thus become smutted, the ears being reached usually through the young silks. During the earlier part of the season the source of infection is the smut spores from the crop of the previous season, but later this source is supplemented by spores developed during the same season.

² Hitchcock and Norton, Bull. Kans. Exper. Sta. No. 62: 183-187. 1896.

The great importance of destroying all smut masses, and doing this if possible before the spores have a chance to scatter out of the pustules, must be recognized in any plan for checking the disease.

INFLUENCE OF WEATHER AND MATURITY ON INFECTION.

It is clear from what has already been stated that if infective material is available, that is, if viable smut spores are in the vicinity, the amount of infection will depend chiefly upon the character of the weather, and secondly upon the growing condition of the corn plants. As the plants develop, the parts that are successively formed are each for a time in a tender succulent condition during which they are liable to infection, but shortly pass over into sufficient maturity to effectively debar the entrance of the germ tubes.

Remembering that the disease is local, not spreading from organ to organ within the plant, but each infection causing pustules only at the

TABLE XLIV.—INCREASE OF SMUT PUSTULES ON DIFFERENT PARTS OF THE PLANT AS THE SEASON PROGRESSES, AS AFFECTED BY DRIER AND MOISTER SOIL, SEASON OF 1896.

DRIER SOIL.					
DATES.	Leaves.	Stem 1st to 5th nodes.	Stem 5th node to tassel.	Tassel.	Ear.
July 6-7.	35	2	1	0	0
July 25-27.	42	4	1	3	0
August 15-17	42	28	27	11	13
August 31.	44	32	29	11	21

MOISTER SOIL.					
July 6-7.	126	4	4	17	0
July 25-27.	144	49	6	48	0
August 15-17	151	89	37	76	23
August 31.	152	96	42	78	26

spot on the plant where the germ tubes enter, it could reasonably be expected that there would be an increase in the number of smut pustules as the season progresses. Actual count demonstrates this to be true.

For studying the progress of infection and of distribution of smut over the plant we may conveniently divide the plant into five regions: (1) lower portion of stem (between first and fifth nodes), (2) upper portion of stem (between fifth node and tassel), (3) leaves (both blade and sheath), (4) ears, infection being mostly through the silk, and (5) tassel, infection being almost wholly in the staminate flowers. Illustrations of smut pustules

in these five regions are shown in Plates X-XII, which are engraved from photographs.

Data on the first appearance of smut pustules are shown in Table XLIV, taken from a plat having the soil on one-half somewhat deeper and moister than on the other half, although the difference in surface level would scarcely be noticeable to the casual observer. In every other respect the two halves of the plat were alike. The table shows an increased number of pustules at each count, the largest portion being upon the leaves, and the next largest upon the lower half of the stem. That the ears are late in showing pustules, which moreover appear almost simultaneously, is accounted for by the fact demonstrated experimentally that their infection almost wholly takes place during the short interval while the silk is elongating and in vigorous growth. The table also shows that the more vigorous the growth of the corn plant, due to the moister, deeper soil, the greater the infection, a point which will be spoken of later.

If instead of counting the pustules the number of smutted plants be taken, the same progressive development of smut is evident. Table XLV

TABLE XLV.—INCREASE OF SMUTTED PLANTS DURING SEASON OF 1896, AS AFFECTED BY SLIGHT DIFFERENCES OF SOIL.

DATES OF OBSERVATION.	South half of plat; somewhat drier and shallower soil.			North half of plat; somewhat moister and deeper soil.		
	Number of plants observed.	Number of plants smutted.	Per cent. of plants smutted.	Number of plants observed.	Number of plants smutted.	Per cent. of plants smutted.
July 6-7.	1483	22	1.5	1536	80	5.2
July 25-27.	1483	30	2.0	1536	149	9.7
August 15-17	1483	113	7.6	1536	251	16.3
August 31.	1483	127	8.5	1536	266	17.3

is constructed from data taken from the same double plat that afforded data for the last table. The figures not only show that more plants became smutted as the season progressed, but that the largest increase of smut was about the middle of August, the infection for which must have been ten or fifteen days earlier. Observations made in Kansas²⁰ during June, July and August of 1894, 1895 and 1896, give similar and confirmatory testimony to the progress of smut during the season.

If the infection continues to take place throughout the season, it were highly probable that the longer the season of growth, the greater the amount of smut developed. Observations were made upon fields of early and late planted corn (Table XLVI), and although other factors, such as the state of the weather at the different stages of maturity, may be accountable for part of the differences, yet the double amount of smut in

²⁰ Hitchcock and Norton, l. c. page 179.

the field planted seven weeks earlier was chiefly due to the longer period of growth affording a longer period for infection.

Another way in which the plant is made more liable to infection is by increase in the amount of tender growing tissue. This may be brought

TABLE XLVI.—SMUTTED CORN PPANTS IN EARLY AND LATE PLANTED FIELDS, 1896.

	Planted about June 20.	Planted May 4.
Number plants counted	4,647	2,482
Number plants smutted	166	298
Percentage	5.7	12.0

about by more luxuriant growth, due to greater water or food supply. The accompanying table (XLVII) shows the effect of both moisture and richness of soil in promoting the smut disease.

In the first case the soil received same treatmet for both halves of the plat, but as already explained, one-half had a greater depth before reach- ing subsoil and had a slightly lower surface and thus kept moister throughout the season. In the second case one-half of the plat was treated

TABLE XLVII.—INCREASE OF SMUTTED PLANTS CAUSED BY GREATER MOI- TURE AND BY GREATER RICHNESS OF SOIL, 1896.

	Dry Soil, August 31.	Moist Soil, August 31.	Unmanured Soil, August 27.	Manured Soil, August 27.
Plants counted	1,483	1,536	939	953
Plants smutted	127	266	59	120
Percentage	8.5	17.3	6.3	12.6

with fresh horse manure at the rate of six and three-fourths tons per acre. In both cases the more luxuriant growth of the corn plants gave the opportunity, through a greater exposure of tender tissues, for increased infection by the conidia of the smut. In the two cases observed, moisture and food supply increased the smut 100 per cent.

These records show that the corn plant continues to be subject to in- fection by smut as long as it is growing, and that whatever increases growth increases proportionally the liability to infection.

The state of the atmosphere at the time the conidia are borne to the plant is most certainly an important factor in promoting the disease. It is only when the air is sufficiently damp that the conidia germs are able to keep their vitality, being very delicate and easily desiccated. Moisture on the surface of the plant is also required to induce germination and

maintain growth until the fungus effects an entrance into the tissues. Yet rain interferes with infection, as it washes the conidia out of the air, and off from the plant.

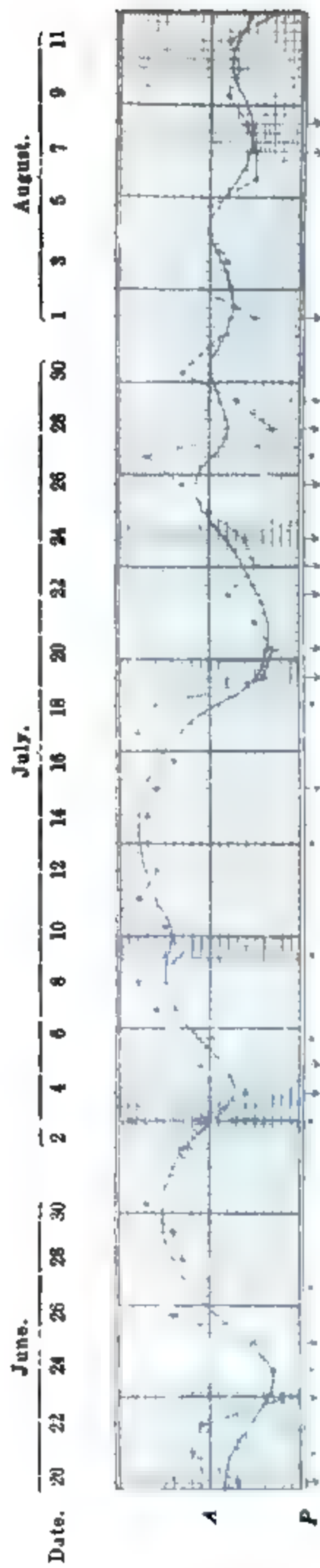
Many scattered facts and observations leave no doubt of the important part that atmospheric conditions exercise in a general way. It was early noticed that closely planted corn suffered more, which we now ascribe mainly to the increased dampness of the air immediately surrounding the plants in such fields. In conducting artificial infection one of the great obstacles to success is found to be the difficulty in maintaining a saturated atmosphere while infection is taking place.

Direct observation in the field upon this point is necessarily difficult, as the exact time of infection can not be directly determined, but must be assumed to be some days before the pustules become visible. The period of incubation varies with temperature and other conditions affecting vegetation in general, but from experimental studies we may safely assume it to be from ten to twenty days. Although without daily or very frequent observations on the appearance of pustules in the field, yet it will be interesting to see if the four observations taken in 1896 bear any relation to the weather conditions of the two or three weeks preceding.

The weather factors for the infectional part of the 1896 season are shown on Chart XLVIII, and prominence is given to cloudiness and the degree of atmospheric moisture. The latter is represented by the difference between the readings of the wet bulb and dry bulb thermometers. The greater the difference, the greater the amount of evaporation and the necessarily drier air to produce it. In plotting the curve the dots are placed at a distance above the base line to correspond with the actual difference in the thermometer readings at each date. The curve has been drawn to represent the average atmospheric moisture from day to day; rise in the curve indicates dryness of the air, and depression indicates moisture. Rainfall in itself can have only a deterrent effect, except in so far as it helps to saturate the air for the time immediately following, so the data for it are given an inferior place on the chart. But cloudiness, which is a highly important factor in keeping the atmosphere damp and in condition for the delicate conidia germs of the smut to float about and thrive, is shown by depth of shading. The temperature, which is high enough at all times throughout the period to insure germination and growth, would chiefly influence the rate of incubation of the smut, and is therefore omitted in the chart.

With this explanation the chart may be intelligently interpreted. It shows three clearly defined periods of moist, cloudy weather; one the latter part of June followed by a week of dry weather, one not so marked early in July followed by more than a week of almost uninterrupted dry weather, and an indefinitely long moist period beginning July 19. Each of these periods was followed by an outbreak of smut proportional to the

CHART XLVIII.—RELATION OF SMUT INFECTION TO WEATHER, AS SHOWN BY ATMOSPHERIC MOISTURE. CLOUDINESS AND PRECIPITATION FOR SEASON OF 1896.



189 Pastures taken on July 6-7.

108 Pastures taken on July 25-27.

200 Pastures taken on August 15-17.

A. Atmospheric moisture. The dots show the average of morning and evening differential readings of the wet and dry bulb thermometers. The smoothed line approximates the general variation of moisture in the air, drier when the line rises and moister when it falls.

P. Precipitation: arrows indicate days when considerable rain fell, and dots when not enough to be measured in the rain gauge. Heavy vertical shading indicates clouded sky throughout the day. Light horizontal shading indicates clouded sky part of the day.

degree in which the infectional period was favorable. The data were taken from the field supplying data for Table XLIV, and include a count of over 3,000 plants. The June period of infection was followed by the appearance of 189 pustules; the early July period, which was not so favorable as the previous one, gave 108 pustules; and the late July period, which was more favorable than either, gave 200 pustules. Both weather and maturity of the corn plants were against any considerable infection during the fourth period, the count giving only thirty-four pustules.

Although the data here presented are imperfect, yet they clearly demonstrate that the state of the weather, especially the atmospheric moisture is an important factor in promoting the smut disease of corn. The capriciousness of the weather may reasonably be assumed to be the cause, in large part, why corn smut does not become a much greater pest than it now is.

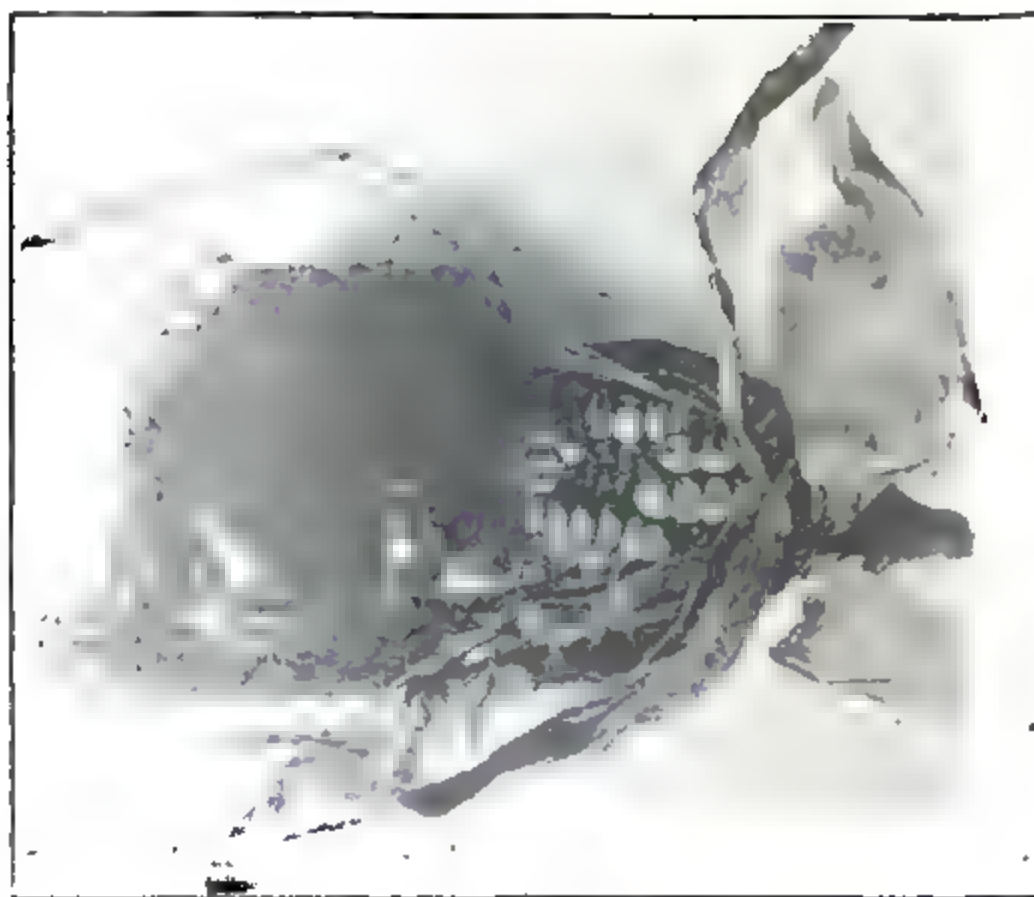
DISTRIBUTION OF PUSTULES ON THE PLANT.

Records were secured in a number of fields in which the data were arranged for the five aerial regions of the plant; leaves, lower half of stem (including brace roots), upper half of stem, tassel, and ears, as stated in the previous section.

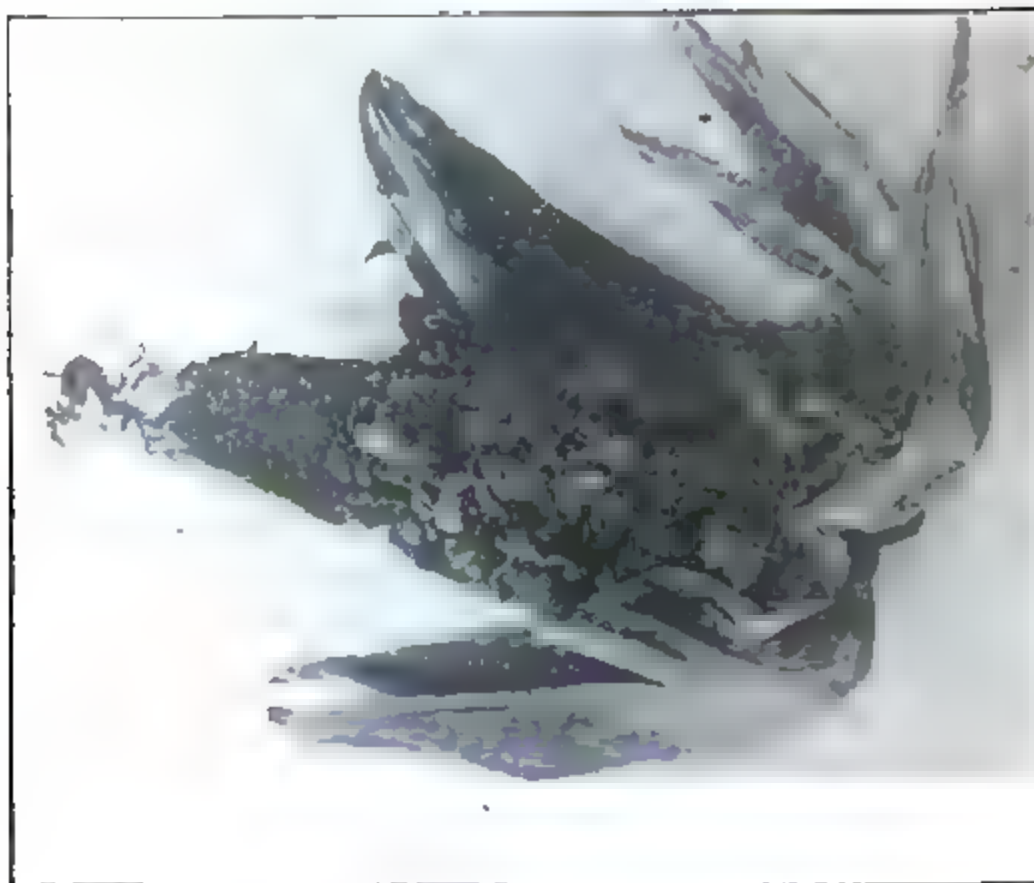
The observations made in 1895, in which areas representative of several fields of dent corn were selected and 1741 smutted plants found in a total count of 22,119, show that more than one-third of all the pustules occurred in the lower half of the stem, and that about an equal number of the remaining two-thirds was found on the upper half of stem, ears, leaves and tassels, respectively. The full data are exhibited in Table XLIX. These proportions do not hold true in all cases, in fact no two fields and no two counts at different dates give the same relationships. The larger part of this variation can be ascribed to the disturbing influence of the weather, although the soil and other conditions of growth have somewhat to do with it, while a part is undoubtedly purely accidental.

TABLE XLIX.—DISTRIBUTION OF SMUT PUSTULES OVER THE PLANT, DATA TAKEN IN SEVERAL FIELDS DURING THE YEAR 1895, 22,119 PLANTS BEING COUNTED AND 1,741 OF THEM FOUND TO BE SMUTTED.

REGION OF PLANT.	Number of pustules.	Percentage of pustules.
Stem between 1st and 5th nodes	753	37.2
Stem between 5th node and tassel	342	16.9
Leaves (blade and sheath)	320	15.8
Ears.	321	15.9
Tassels	287	14.2
Pustules on 1,741 plants	2,023	100.0



A



B

EARS OF SMUTTED CORN.

A illustrates the action of smut when only part of the silks are infected by smut conidia; half of the ear is consequently well developed, the other half is smutted.

B shows an ear with every kernel smutted. The smutted tissue is due to the earlier smutted part at the base of the ear absorbing the nutrient derived from the silks as well as the barren ones; the smutted tissue is consequently more luxuriant than the healthy tissue of the ear.

The data taken in 1896 upon the plat having the soil of one-half moister than that of the other (Table L) show that most pustules appeared on the leaves, the lower half of the stem coming second, and that the increased growth due to the moisture is associated with an increase in the proportion of pustules on the leaves.

TABLE L.—DISTRIBUTION OF SMUT PUSTULES OVER THE PLANT, AS AFFECTED BY MOIST AND DRY SOIL, OBSERVATIONS MADE AUGUST 31, 1896.

DRIER AND SHALLOW SOIL.		
REGION OF PLANT.	Number of pustules.	Percentage of pustules.
Stem between 1st and 5th nodes	32	23.4
Stem between 5th node and tassel	29	21.2
Leaves (blade and sheath)	44	32.1
Tassel	11	8.0
Ears	21	15.3
Pustules on 1,483 corn plants	137	100.0

MOISTER AND DEEPER SOIL.		
Stem between 1st and 5th nodes	96	24.4
Stem between 5th node and tassel	42	10.7
Leaves (blade and sheath)	152	38.6
Tassel	78	19.7
Ears	26	6.6
Pustules on 1,536 corn plants	394	100.0

If we turn to data (Table LI) taken upon the plat which had one-half enriched with stable manure, about the same relationships will be seen to hold as in the last case cited. Here the increase in the number of pustules due to more luxuriant growth is especially marked in the leaves, while on the lower part of the stem the variation in percentage of pustules due to conditions of growth is slight.

TABLE LI.—DISTRIBUTION OF SMUT PUSTULES OVER THE PLANT AS AFFECTED BY RICHNESS OF SOIL, OBSERVATIONS MADE AUGUST 27, 1896.

UNMANURED.		
REGION OF PLANT.	Number of pustules.	Percentage of pustules.
Stem between 1st and 5th nodes	22	33.8
Stem between 5th node and tassel	21	32.3
Leaves (blade and sheath)	8	12.3
Tassel	10	15.4
Ears	4	6.2
Pustules on 939 corn plants.	65	100.0

TABLE LI—Continued.

MANURED.

Stem between 1st and 5th nodes	42	32.1
Stem between 5th node and tassel	17	13.0
Leaves (blade and sheath)	62	47.3
Tassel	7	5.3
Ears	3	2.3
Pustules on 963 corn plants.	131	100.0

Now turning to data taken from plats, or rather fields, for they were several acres each, which were planted at different dates, very different proportions will be seen (Table LII).

The lower part of the stem is far ahead of the other regions, except in case of ears in the late planted field, a deviation which must surely be referred to the state of weather during the time infection was possible.

TABLE LII.—DISTRIBUTION OF SMUT PUSTULES OVER THE PLANT AFFECTED BY DATE OF PLANTING, 1896. OBSERVATIONS MADE AUGUST, 1896.

PLANTED ABOUT JUNE 20. OBSERVED SEPTEMBER 19.

REGION OF PLANT.	Number of Pustules.	Percentage of Pustules.
Stem between 1st and 5th nodes	90	29.7
Stem between 5th node and tassel	28	9.2
Leaves (blade and sheath)	2	.7
Tassel	2	.7
Ears	181	59.7
Pustules on 4,647 corn plants.	303	100.0

PLANTED MAY 4. OBSERVED SEPTEMBER 3.

Stem between 1st and 5th nodes	175	49.2
Stem between 5th node and tassel	98	27.5
Leaves (blade and sheath)	29	8.1
Tassel	41	11.5
Ears	13	3.7
Pustules on 2,482 corn plants.	356	100.0

In general our observations appear to warrant us in assuming that at least in Indiana the lower half of the plant, especially if the leaves on that part be included, often bears more than half of the smut pustules, and sometimes far more than half, while the upper part, including tassel and ear, is much less affected. It is partly to be accounted for by the

longer period of exposure to infection, to the generally more favorable weather when in condition for infection, and to the prolonged opportunity for infecting the nodes enclosed by the leaf sheaths.

Corn, in common with other members of the grass family, keeps the lower end of the internodes in a tender growing state for a long period, and the requisite rigidity of the stem is maintained by the enwrapping sheath of the leaf. Moisture accumulates within the sheath and comes to hold more or less nutrient matter. It is a good culture solution for various germs, and smut spores finding their way between the sheath and the stem, may germinate, the conidia thus produced in turn germinating and piercing the plant where it is tender, just above the node. Plate X, A shows pustules at four lower nodes of a stem, each having become exposed by bursting the sheath. That these four spots received their infection from spores or conidia falling in between the stem and sheath, or washed in by rains, after the leaves were well expanded, appears to be highly probable.

The brace roots sometimes become affected through their tender ends, before these have penetrated the soil. Pustules thus situated have been counted in with those on the stem in the above statistics.

The leaves are the part of the plant to first show pustules, as a rule, which mostly appear early, as may be seen by reference to Table XLIV. This comes about from their habit of growth. They expose more surface to infection than the other parts, and for a time they are the only part of the plant thus exposed, the stem being wholly enwrapped and hidden by them, and the ear and tassel appearing late.

In estimating the loss from corn smut, the investigator usually counts the stalks affected, and the farmer generally notices only the ears. The smut disease never kills the whole plant, unless it attacks a small seedling, and that is rare in the field, and it is even less likely to kill a part of the plant. The fungus derives its nourishment from the juices of the plant, and thrives as the plant thrives. To estimate the loss from smut it is necessary to know how much the yield is decreased in weight and quality.

No wholly satisfactory statistics are available. That any plant supporting such a rampant fungus as corn smut must necessarily grow to a less extent than it would have done if none of its forces had been diverted, requires no argument. What we need to know is whether this stuntifying of the plant is uniform, or more in one part than another. The only data available are those taken in Kansas,²⁷ where it was found that the loss of weight of ears on stalks smutted in all degrees was over 25 per cent., while the loss in weight of the rest of the plant was less than 5 per cent. In another set of weighings the loss in weight of ears on smutted stalks amounted to about one-third.

It may be safely assumed, we think, that the loss of crop is insignifi-

²⁷ Hitchcock and Norton, Bull. Kans. Exper. Sta. No. 62: 171, 1896.

cant for the stover, being in fact almost wholly in the ears, and that there is considerable loss whether the ears themselves are affected or are sound but on smutted stalks. It would seem that if the total number of smutted plants, however affected, be divided by three or four, a figure approximating the actual loss to the farmer would be secured.

PREVENTION BY SPRAYING.

In the light of what has been said above, the possible methods of preventing corn smut clearly resolve themselves into two categories. First the smut masses can be removed or destroyed before germination of the spores is possible, thus clearing the region of the infective material; or secondly, the growing plants can be protected by a fungicide or otherwise from the attack of flying conidia germs. This Station has done no experimental work along the first line and no record of such work with statistical results has come to the attention of the writers; but some interesting and successful work has been done along the second line.

Experiments in spraying were carried out in 1895 and 1896 at this Station, with sufficient completeness to demonstrate the possibilities of this method of prevention. The only record of similar work elsewhere appears to be that of a trial on a small scale at the Kansas Station by Kellerman²⁸ in 1890. Bordeaux mixture, chloride of iron and sulfide of potassium were used as the fungicides, and eighty-six plants were treated altogether, with 117 plants untreated for control. Eleven per cent. of smutted plants occurred in the untreated portion, against 7 per cent. in the treated. The favorable result, however, was based upon too small a test to be especially significant.

In the experiments of 1895, some account of which has already been published,²⁹ one corner of a large field of dent corn, planted about May 8, was selected for the tests. Two fungicides were used, five rows being sprayed with Bordeaux mixture and five with ammoniacal copper carbonate, alternate strips of five rows each being left untreated as controls.

The spraying was done at frequent intervals during the time that infection was likely to occur, using a knapsack sprayer. Rain much interfered with the thoroughness of the work, as a shower soon after spraying washes away the fungicide and leaves the plants again unprotected. The state of the weather, therefore, largely controlled the time of spraying, and sometimes it became necessary to repeat the spraying after an inopportune rain. A number of rainy or wet days in succession gives the fungus an opportunity to secure a foothold that treatment by spraying can not reach.

The dates for rainfall and spraying, with the amount of rain covering

²⁸ Kellerman, Corn Smut, Bull. Kans. Exper. Sta. No. 23: 103.

²⁹ Stuart, Fungicides for the prevention of corn smut. Proc. Ind. Acad. Sci. for 1895: 96-99.

he period during which infection was likely to occur, are given in the Table LIII. On both June 8 and 19, after one plat had been treated with ammoniacal copper carbonate, it began to rain and the Bordeaux mixture was not applied to the other plat; on other dates the two plats were treated alike. The long interval without spraying between July 5 and 20 was an error due to absence, and gave an unfortunate opportunity for infection.

TABLE LIII.—WEATHER AND TREATMENT, 1895.

May 26, rain .01 in.	July 14, rain .13 in.
June 8, sprayed.	July 15, rain .42 in.
June 12, sprayed.	July 17, rain .63 in.
June 12, rain .25 in.	July 18, rain .22 in.
June 13, sprayed.	July 19, rain .29 in.
June 17, sprayed.	July 20, sprayed.
June 18, rain .02 in.	July 20, rain .26 in.
June 19, sprayed.	July 21, rain .03 in.
June 19, rain .15 in.	July 25, rain .25 in.
June 20, rain .21 in.	July 25, sprayed.
June 21, sprayed.	July 27, rain .23 in.
June 24, rain .57 in.	August 3, sprayed.
June 25, rain .03 in.	August 3, rain .04 in.
June 26, rain .13 in.	August 6, rain .35 in.
June 27, sprayed.	August 11, rain .11 in.
June 30, rain .68 in.	August 14, sprayed.
July 5, sprayed.	August 26, rain 1.02 in.
July 8, rain .82 in.	

The Bordeaux mixture was made in the customary way, with six pounds of copper sulfate, four pounds of lime and 50 gallons of water. For a time this strength seemed to do no harm but later the plants showed some injury, and after July 21 the solution was applied one-third weaker, that is 75 gallons of water were used instead of 50 in the recipe.

The ammoniacal copper carbonate at first was made by taking one ounce of copper carbonate and adding enough ammonia to bring it into solution and then diluting with water to make nine gallons. This gave .088 per cent. of copper in the solution. The percentage of ammonia was not determined. As this solution proved injurious to the corn plants, it was soon replaced by one compounded in a different way. Instead of using any definite quantity of copper carbonate and then adding sufficient ammonia to dissolve it, the strong ammonia (28 per cent.) was reduced to 3.2 per cent., and an excess of copper carbonate added. This was shaken at intervals for some time to allow the ammonia to dissolve as much of the copper carbonate as possible. When wanted for use the clear liquid was taken and diluted to the strength desired. This solution, which now

contained .148 per cent. of copper and .14 per cent. of ammonia. as determined by the method devised by Penny³⁰ of the Delaware Station. at first did no injury. As it held nearly twice as much copper as the first solution, it is evident that it was not the copper, but the ammonia. that caused injury in the first trials. After a time the applications of this solution began to show evidences of injurious action, and after July 24 it was reduced in strength. From this time until the end of the experiment the solution contained .085 per cent. of copper and .08 per cent. of ammonia.

The first smut pustules were noticed on August 14 and the examination for percentage of smut was made on September 3, giving ample time for all infections to develop sufficiently to become evident. The results of the spraying are shown in Table LIV, and give ample evidence of efficiency. The number of smutted stalks was reduced from 13 per cent. to a little below seven per cent. by use of ammoniacal copper carbonate to a little below four per cent. by use of Bordeaux mixture, that is to about one-half and one-fourth, respectively.

TABLE LIV.—SPRAYING CORN PLANTS WITH BORDEAUX MIXTURE AND AMMONIACAL COPPER CARBONATE TO PREVENT SMUT, DURING 1895.

	Unsprayed.	Sprayed with Bordeaux mixt.	Sprayed with am. copper carb.
Total number stalks	1441	365	347
Number stalks smutted	198	14	24
Per cent. smutted	13.4	3.8	6.9*

In 1896 further experiments in spraying were undertaken, using the same fungicides as in the previous year. The usual strengths were at first used, but as the season progressed had to be reduced, for as the plants became older they grew more susceptible to injury from the fungicide. The Bordeaux mixture at first (June 3) contained 50 gallons of water to six pounds of copper sulfate and four pounds of lime. On June 22, the water was increased to 60 gallons, and on July 10 to 75 gallons. The ammoniacal copper carbonate contained the following percentages of ammonia and of copper for the several sprayings:

	Ammonia. Per Cent.	Copper. Per Cent.
June 3 . . . . .	.15	.150
June 11 and 16. . . . .	.10	.106
June 22 and 26. . . . .	.08	.085
July 3, 10 and 17. . . . .	.05	.053

³⁰ Penny, Bull. Del. Exper. Sta. No. 22. 1893.

*This number is two-tenths larger than the one given in Proc. Ind. Acad. Sci. for 1895, page 98, an error in calculation having been discovered.

The plants were sprayed for the first time on June 3, when they were from three to eight inches high and at intervals until July 17. Two days after this a severe wind storm, accompanied with heavy rain, blew down the corn so completely that further attempts at spraying had to be abandoned. More than a week of damp cloudy weather, with heavy

TABLE LV.—SPRAYING CORN PLANTS WITH BORDEAUX MIXTURE AND AMMONIACAL COPPER CARBONATE TO PREVENT SMUT, DURING 1896.

	Unsprayed.	Sprayed with Bordeaux mixt. nine times.	Sprayed with am. copper carb. eight times.
Total number stalks	1536	704	733
Number stalks smutted	266	60	65
Per cent. smutted	17.3	8.6	8.8

rainfalls, immediately succeeded the wind storm, and provided conditions for infection that doubtless sufficiently account for the rather large percentage of smut among the sprayed plants. The first pustules were seen July 6, and on August 31 the final record of smut was taken.

TABLE LVI.—FREQUENCY OF SPRAYING IN ITS EFFECT UPON CORN SMUT IN 1896.

	Unsprayed.	Sprayed with Bordeaux mixture.		Sprayed with am. copper carb.	
		June 26. July 10.	June 3, 11, 22. July 10.	June 26. July 10.	June 3, 11, 22. July 10.
Total number stalks	1503	350	338	394	387
Number stalks smutted	127	25	11	29	30*
Per cent. smutted	8.5	7.1	3.3	7.4	7.8*

The result of this year's work, in spite of the early date at which the sprayings ceased, was highly encouraging. In Table LV the amount of smut is shown to have been decreased 50 per cent. by the use of Bordeaux mixture, and slightly less by the ammoniacal copper carbonate, the former having been applied nine times between June 3 and July 17, and the latter eight times, the dates (given on a previous page) being the same for both, with the exception that spraying with ammoniacal copper carbonate was omitted on June 8. In Table LVI the results of spraying one-half and one-fourth the number of times during the season are given, and show a general falling off in efficiency as the sprayings are decreased.

* These numbers are so large that they must clearly be due to some accident, probably imperfect spraying.



RESULTS OF ARTIFICIAL INFECTION.

The upper figure shows a corn seedling bent to one side by a pustule of smut at a lower node, just above the soil. The right hand plant remained unaffected.

The lower figure shows three unaffected corn plants, and one bent to one side by a smut pustule. The plants were all of the same age, and the exhaustive effects due to the growth of the smut are well shown.

The data in Tables LV and LVI, although not exactly comparable, being taken from different, yet near by fields, still clearly show that Bordeaux mixture when applied at the right time, even with so few as four applications, will greatly reduce the smut, and furthermore that ammoniacal copper carbonate is by no means so important a fungicide for the same purpose.

By considering the percentage of reduction effected in the three trials at this Station, as in Table LVII, it may be seen that in our experiments

TABLE LVII.—PERCENTAGE OF REDUCTION OF SMUT IN CORN BROUGHT ABOUT BY A DIFFERENT NUMBER OF SPRAYINGS DURING THE SEASONS OF 1895 AND 1896.

	Sprayed with Bordeaux mixture.	Sprayed with am. copper carb.
Sprayed 10 times 1895	72	49
Sprayed 8 times 1896	50	49
Sprayed 4 times 1896	61	8
Sprayed 2 times 1896	16	13

the use of Bordeaux mixture brought about a reduction of smut amounting from 72 to 16 per cent., according to the number of sprayings, and that ammoniacal copper carbonate gave from 49 to eight per cent. That spraying is a genuine means of controlling corn smut, and that for the purpose Bordeaux mixture is preferable to ammoniacal copper carbonate we believe may be regarded as beyond question.

It must be pointed out in this connection that while judicious spraying is capable of largely reducing the amount of smut in a crop, it can not wholly prevent it. This is partly on account of the not infrequent interference of protracted bad weather and more particularly on account of the impossibility of protecting the ear by any method of spraying. The ear is infected through the young silks and these can not be effectively sprayed or if they could be it would also prevent the pollen from acting and thus induce sterility. While spraying, however, can not be expected to prevent loss from smut in the ear, yet it is capable of greatly reducing the loss in weight of ears that are not themselves smutted, but are on stalks which would otherwise bear smut. What this amount of saving is can only be conjectured in the absence of statistics.

When the expense of spraying and its limitations are considered it is doubtful, however, if it can be regarded as a practicable or promising method for the control of smut in field corn. So obvious is this, that we think it superfluous to present figures on the expense of spraying and the profit from it. Although we have demonstrated that spraying can be made effective for the saving of half or more of the usual loss from smut in corn, yet we expect no farmer to adopt the practice. The work clearly

shows, however, that the assumption that corn smut infection is conveyed through the air must be correct, for when the surfaces of the plants are protected by a fungicide, the smut infection is reduced or prevented. It is, therefore, worth while to inquire if the source of the infection can not be reached and removed.

PREVENTION BY DESTROYING SMUT MASSES.

In the prevention of corn smut, having shown the worthlessness of all treatment of seed and the moderate value only of treatment by spraying, some words should be said regarding the only method that at the present time really appears to promise a practical way of controlling the disease, that is gathering and destroying the smut masses. As already mentioned no statistics have been taken on either the cost or effectiveness of this method, but there is every reason to believe that in both respects it is practical and profitable.

During the early part of the century European writers advocated cutting away the smut pustules as they appeared on the plants, in order to stop the fungus from weakening the corn plant. Later, when it was fully understood that the disease was propagated through the medium of the smut powder, writers advised the collection of the smut masses on the ground that it is well to destroy pestiferous growths of all kinds, and in so doing lessen the chances for their increase.

Not until recently have the reasons for this form of procedure been capable of satisfactory statement. We now know that the spores at any time for a year or more after they turn black in the pustules, whether attached to the living or dead corn plant, or blown about over the fields and meadows, are capable of growth, moisture and temperature favoring, and of the production of minute conidia by the hundredfold, which carried by the air disseminate the disease to the growing corn plant, throughout the warm season of the year. The corn plant is subject to infection as long as it has tender growing tissues, practically until it is nearly matured in late summer.

What is needed from our present point of view is to gather the pustules as they appear in the field, and destroy them, and it is believed that the amount of smut subsequently appearing in the vicinity will be largely decreased, the decrease being greater the longer the practice is maintained.

The plan should be to go through the field more than once while the corn is still growing, beginning in July, and finally while husking or handling the fodder to secure smut masses previously overlooked. These should be burned or put in boiling water, to destroy the life of the spores. Care should be taken not to permit the black powder to be scattered in the handling.

This is a simple and feasible thing to do. What it will cost we do not know, but believe that Professor Bessey, formerly of the Iowa Station.

now of the Nebraska Station, was liberal in his estimate when he said some years ago that "the cost per annum of gathering and burning the smutted ears ought not to exceed 10 or 15 cents per acre; a smart boy carrying a bag slung over his shoulder ought to be able to earn good wages in 'smutting' corn at 10 cents per acre."

The matter of cost is a practical one, and by rights its estimation belongs to the man whose interests are at stake. This Station has incurred considerable expense and been to much pains to secure the facts set forth in this report. If the farmers of the State will report to the Station any work they may undertake in this line of prevention, the information will be heartily welcome, and will be accepted as an appreciative response to efforts in their behalf. We would be glad to know how much smut was gathered, the dates, time occupied, cost, and any other kindred items thought to be of interest.

INJURY TO ANIMALS.

The conspicuous and peculiar development of corn smut has at all times excited deep suspicion that it would prove harmful to the animal economy, especially if eaten. One of the first close investigators of the parasite, Imhof, felt it necessary when he wrote in 1784, to show whether this assumption was well founded or not. He experimented upon himself by taking a considerable quantity of the spores before breakfast every morning for a fortnight, also applying the spores to a wound on his hand, and employing them as snuff. He experienced not the slightest harm or ill effects from their use. In 1836 Bonafous records his observations at some length. He fed cats, geese and chickens for several days with smut powder mixed with food in equal quantities, and they ate it readily with no appearance of injury. He also took some himself at different times, and had observed that cattle ate it freely, entirely without bad results.

Reports in the agricultural journals³¹ are sufficiently numerous to in-

³¹ A few citations are given here, although many others might have been produced.

1861. Amer. Farmer. E. Wood reports having lost 3 oxen, 3 cows and 3 calves, from eating corn smut.

1865. Country Gentleman (p. 43). D. M. M. attributes loss of hair in cattle to corn smut.

1869. Country Gentleman (p. 275). R. J. L. reports the death from smut of several cattle in his vicinity.

1876. Country Gentleman (p. 796). O. S. Randall of Iowa reports the loss by one of his neighbors of 8 head of cattle and by another of 2 head from eating smut.

1878. Country Gentleman (p. 584). S. P. of Vermont states that he has lost several head of cattle and sheep on account of smut.

1880. Amer. Agriculturist (p. 447). The editor considers it injurious to stock.

1881. Amer. Agriculturist (p. 318). A writer deems it injurious and capable of causing abortion.

1881. Country Gentleman (p. 579). H. Stewart of New York believes it causes abortion.

1896. Farmer's Guide (p. 642). The editor speaks of the general belief that it causes abortion and other ills.

dicate that the opinion is widespread and general, even at the present time, that corn smut is a dangerous food material. In the early days its reputation was even worse, in fact astonishingly bad, if we may trust the word of Roulin, who read a paper before the French Academy in 1829 on the "Ergot of maize, and its effect upon men and animals." He asserts that in Colombia, S. A., where he traveled, the smut caused the hair of men, mules and pigs to fall out, and sometimes the limbs were atrophied and weakened; wild animals, such as deer, native dogs, monkeys and parrots, would eat so heavily of it as to be prostrated before they could leave the field. Yet he says that when this same smutted corn was carried into the mountainous uplands, it no longer proved harmful, and could be eaten without deleterious effects. His description reminds one of the symptoms now ascribed to the so-called corn stalk disease of the middle west, a malady or group of maladies, not infrequently charged to corn smut.

Recent tests in feeding smut, as well as other experimental evidence, agree with the earliest trials, however, in maintaining its essentially innocuous character in spite of popular opinion to the contrary. Practically no work of this character has been done by this Station, and only the briefest outline of work elsewhere can be given room.

In 1869 Gamgee³², while employed by the U. S. Department of Agriculture, fed two cows with 42 pounds of corn smut. Each cow was given, beginning on February 26, one and a half pounds of corn meal, mixed with three ounces of smut thrice daily, and cut hay without restriction. For one cow it was given dry and for the other wet. The amount of smut was subsequently increased to six ounces, and after a time to 12 ounces. At the end of three weeks one cow had gained a little in weight, and the other which received dry food, lost a little. No symptoms of injury were noted.

In the fall of 1880 Henry³³, of the Wisconsin Station, fed two cows with smut. One cow was given six ounces, mixed with bran, in two daily feeds, which was gradually increased to 32 ounces by the eleventh day. No evil effects resulted. The other cow was fed in the same way, the increase being to 64 ounces, by the thirteenth day, when the trial was interrupted by the sudden illness and death of the animal. A post mortem examination not embracing the brain, however, gave no evidence that the smut caused the sickness.

In 1889-90 a trial was made by Professor Morrow of the Illinois Station, reported by Moore³⁴, of feeding a steer one pound of smut daily for 20 days and then about one and a half pounds for 22 days more, with no symptoms of injury.

³² Gamgee, Report of Commissioner on Diseases of Cattle in the United States: 73-81. 1871.

³³ Henry, Rep. of Regents Univ. Wis. 1881: 50-54. Abstract in Tenth Rep. Wis. Exper. Sta. for 1893: 81-83, and in Breeders' Gazette 14: 360. 1888.

³⁴ Bull. Bureau Animal Industry. No. 10: 15-16. 1896.

In 1893 and 1894 experiments were conducted by Dr. F. L. Kilborne, under government auspices, and reported by Moore, in which a large amount of smut was fed to three two-year old steers for seven days in the first trial and to two heifers for 16½ days in the second. One heifer consumed an average of over three and a half pounds of smut daily and the other over four pounds. None of these animals showed any ill effects.

In the fall of 1895, Clinton D. Smith²⁵, of the Michigan Station, tried feeding smut to four cows, three of them pregnant. Two of them were given smut daily for 11 days, beginning with two ounces and increasing regularly to one pound each, this last amount filling a two-quart measure. The other two cows were fed 43 days, and received an amount beginning with two ounces and increasing to 11 pounds daily for each. Ten pounds would fill a half bushel measure. It proved an acceptable food, being preferred when in moderate amount, but palling somewhat when excessive, all the animals thriving on it, without symptoms of injury in any particular.

At about this time Mayo²⁶ of the Kansas Station administered to Guinea pigs a concentrated alcoholic extract of corn smut, which proved entirely harmless.

The only direct test coming to our attention in which deleterious results could be ascribed to the smut is recorded in a German veterinary magazine. In 1860 the abortion of 11 cows, said to have eaten corn smut, was observed by Haselbach²⁷. Wishing to learn the truth of the assumption, he fed two bitches with 15 grams (about one-half ounce) of dry smut each, and on the day following half that amount, with but little other food. Abortion followed. The information is too meager, however, to give this instance much weight.

More or less complete chemical analyses have been made of corn smut. The analysts²⁸ have found substances in which they trace a resemblance to ergot and thus appear to confirm the popular opinion that it contains some active principle; Cressler separated what he thought to be an alkaloid identical with that of ergot, and Rademaker and Fischer called a similar substance found by them ustilagin. Other chemists²⁹ applying the customary tests to extract solution, find no evidence of an alkaloid in corn smut, and believe the substances so referred by the analysis

²⁵ Smith, Bull. Mich. Exper. Sta. No. 137: 41-46. 1896.

²⁶ Mayo, Bull. Kans. Exper. Sta. No. 58: 68-70. 1896.

²⁷ Haselbach, Magazin für Tierheilkunde, 1860. Quoted in Zurn and Plant, "Die Pflanzliche Parasiten auf und in dem Körper unserer Haussäugetiere." 2d ed. Weimer, 1887, page 68, footnote.

²⁸ Dulong, Jour. de Pharm. 14: 556. 1828.

Cressler, Amer. Jour. Pharm. for 1861: 306.

Parsons, Rep. Dept. Agric. for 1880: 136-138. 1881.

Hahn, Amer. Jour. Pharm. 53: 496. 1881.

Rademaker and Fischer, Med. Herald for 1887: 775.

²⁹ Kedzie, Bull. Mich. Exper. Sta. No. 137: 45. 1896.

Mayo, Bull. Kans. Exper. Sta. No. 58: 69. 1896.

to have been decomposition products not present originally in the smut. From the results of some preliminary tests made by ourselves, we are inclined to dissent from the views of the two last mentioned investigators. The results obtained by reputable physicians in the use of the fluid extract as an oxytotic medicine indicates that it possesses some principle comparable with the active agent in ergot, although that agent may not necessarily be an alkaloid, according to recent studies.

The physiological action of corn smut, used as a fluid extract, has been studied by Mitchell⁴⁰ of the Medical School of the University of Pennsylvania in 1883, by Taylor of the Jefferson Medical College in Philadelphia in 1886, and by Burt, probably in 1868. We have, unfortunately only been able to consult the first one of these theses. Dr. Mitchell experimented upon frogs, and found that its action upon the nervous system was marked. It especially affected the cerebral portion of the brain and the receptive part of the spinal cord, causing a loss of reflex movement, depression and irregularity in respiration, with some convulsions. If the amount of the drug administered was large, volitional movement was suspended as well as the reflex movement, inducing paralysis. Although the narcotic action proceeds from the nervous centers, yet death is directly caused by arrest of respiration. If death does not ensue, the animal soon recovers and shows no harmful results from the experience. He considered the action of the drug to be similar to that of potassium bromide, and somewhat less to that of ergot.

The question that chiefly interests the farmer in this connection is whether corn smut when mixed with food is a poison or not. If for clearness, we agree that, to quote a medical authority, "poison is a drug, whether animal, vegetable or mineral, which in small quantities destroys health and life, but differs from a medicine only in the degree or intensity of its effects," I think we must conclude that corn smut is not a poison. The overwhelming evidence that cattle and other animals may eat it in large quantities and show no abnormal effect clearly proves that point. On the other hand, certain excessive amounts are capable of producing convulsions, paralysis and death. There can be no doubt that the death of one cow in the trial conducted by Henry, in Wisconsin, was due exclusively to smut poisoning, the symptoms being concordant with those produced in laboratory studies. Professor Henry's conclusion⁴¹—"it is most evident to my mind that the cow was killed by the corn smut, and that the brain was affected thereby"—is shown to have been well taken, and now stands beyond question.

Of course some rational explanation is required to account for the rarity of symptomatic results when smut is fed to animals, even in large amount, for I think we must agree that half a bushel a day, as in the Michigan trials, is a large amount. In the first place animals probably

⁴⁰ Mitchell, Jas. The physiological action of *Ustilago maidis* on the nervous system. Inaug. Thesis, Univ. Pa. 1883. Therap. Gaz. Detroit 10: 223-227. 1886.

⁴¹ Henry, W. A.—Breeder's Gazette 14: 360. October, 1888.

differ much individually in their susceptibility to such narcotic poisoning. Then it has been noticed that smut fed dry more often produces abnormal effects than when fed wet, which has led writers to conclude that all the action followed purely from physical causes⁴². But this view appears to be no longer tenable, for injury to the digestive tract has not been observed by any veterinarian or experimenter, even in small degree. It is possible, however, that when the smut is taken dry the narcotic principle is more surely and quickly extracted from the fungus while in the animal's stomach, and also more readily absorbed into the system and rendered effective. This leads, naturally, to the question of the digestibility of the fungus, and its properties as a food, for the medicinal agent may be so effectually guarded by the indurated coat of the spores that it ordinarily does not escape, or only in small amount, during the passage through the animal. On this topic little information is available, but what there is will be given later.

We may sum up the results of our inquiry into the medicinal or poisonous action of corn smut as follows: as eaten by animals in the field it is only rarely injurious; the action, when any occurs, affects the nervous system, and except in the unusual case of death, causes no permanent injury; the alkaloidal, or other active principle, occurs in corn smut in small amount, and only under rare and exceptional circumstances is an animal likely to eat enough of the smut in any form to be affected by it. Besides being capable of causing convulsions and paralysis when administered as a drug it will also stimulate uterine contraction, but its action is so mild that abortion is but a remote possibility.

In short, corn smut is but rarely injurious to animals, and then only when eaten in excessive amounts, and often not even then. What small danger there is somewhat increases when cattle are restricted in amount of water and in other palatable food, as occasionally occurs when they are turned into a field of smutted corn stalks during a period of drouth. Smut is relished by most cattle, and they are likely to eat all that can be found.

DIGESTIBILITY OF SMUT.

It is a constantly repeated assertion, when the question of the spread of the smut disease by stable manure is touched upon, that the spores are not acted upon by the digestive processes, and that they pass through the animal with their germinating powers unimpaired. This appears to rest upon no direct evidence, if we may except one obscure instance not generally known to American writers. The observation referred to was reported in an Italian veterinary journal⁴³ for 1884. Spores that had

⁴² Chestnut, Preliminary catalogue of plants poisonous to stock. Annual Report Bureau Animal Industry for 1898: 393.

⁴³ Morini, Clin. Veterin. 1884. Abs. in Bot. Centr. 21: 367. 1885.

passed through the alimentary tract were found to be in viable condition and in part germinating.

A test made by ourselves does not substantiate this report. Material was collected the day following the feeding of smut, a cow having eaten about a half bushel of corn smut freshly gathered from the field (in December), given with her three daily rations. The moist material was permitted to remain unseparated for 24 hours at ordinary room temperature, which is high enough to induce germination of corn smut spores under right conditions of moisture. The spores were then washed out and tested in drop cultures, using Pasteur sugar solution, manure liquid, and pure (distilled) water. Control cultures were made in the same media, spores being taken out of the material from which the cow had been fed. Good germination resulted in all the control cultures, but not a spore grew in the others, although the tests were repeated, nor were there any indications that germination had in any case taken place during the previous 24 hours while the material had been kept under favorable conditions. The microscopic appearance of the fresh and ingested spores was not materially different, but the latter were undoubtedly unviable. This is but one test, yet the conditions were favorable, the animal having been fed an excessive amount of smut (and without noticeable injury), and the control showing good power of germination.

We may grant the correctness of both these observations by assuming that in cases where the animal is fed to excess, and is somewhat cloyed, part of the spores may occasionally pass uninjured, as sometimes happens with corn, oats and other seeds. Nevertheless, there seems to be very little warrant for the customary statement that the smut disease can be spread by the smut fed to animals. True, the uneaten portions may be carried back to corn land with the unfermented parts of the manure, and thus prove to be infective, but that is a different matter, already discussed.

This view of the digestibility of the spores, that is, that while the exterior, dark colored wall of the spore, from its indurated and highly resistant character, is little affected by the digestive processes, yet the contents of the spore are more or less extracted, is a view that accords well with the fact brought out by a number of experimenters, that animals thrive upon a ration having smut as the principal ingredient. Analysis, in fact, shows that corn smut is possessed of high nutritive value⁴⁴ containing more protein than does corn, oats or clover hay, together with a high content of carbohydrates. All this nutritive material is not inside the spores, however, for our own tests with Fehling's solution show that much of the sugar present is associated with the general detritus which accompanies the spores. This sugar, which is probably derived from the corn plant during growth, rather than from the fungus, was

⁴⁴ See Bull. Mich. Exper. Sta. No. 137: 45. 1896; and Farmers' Bulletin No. 69: 17. 1901.

found by Dr. Kedzie to amount to four per cent. of the dried mass, and he considers that it accounts for the relish with which cattle eat the smut.

It is doubtful if any one will ever find reasons for advocating the use of corn smut as a food for cattle, yet when judiciously fed, it is probable that animals will thrive as well on it as on other rich foods, and that the danger from narcotic poisoning is so exceedingly small that it may well be disregarded.

The need of further research upon the digestibility of smut, the spores and detritus being separately considered, is, however, emphasized by the anomaly that while smut does contain a certain small amount of an active principle, and that the soluble parts of the smut appear to be digested and absorbed by the animal system, yet of the many animals that the records show have been experimentally fed with large amounts of smut only one has been fatally injured, and few others or none have shown abnormal symptoms. It may be that most cattle are little susceptible to this kind of narcotism, or they do not absorb the deleterious substance readily, or it is present in exceedingly small amount. At any rate, an explanation of some of the discrepancies between various reports must await investigation of the facts.

SUMMARY.

The results of our investigations and studies may be summarized as follows:

1. The common smut of corn, the true Latin name of which is *Ustilago Zeae*, has been known, according to published accounts since 1822 in America, and since 1752 in Europe.

2. From the first, smut has been considered by cultivators and scientists alike as the cause of much injury to the corn crop. The loss will average one to three per cent. a year for Indiana, and sometimes far exceeds this amount. Reckoned as money, the loss averages 10 to 30 cents an acre, or \$375,000 to \$1,125,000 a year for the whole State, with some years much higher.

3. Experimental studies under direction of the French government were begun over a hundred years ago. But a knowledge of the life history of the fungus, which was necessary before a rational means of controlling the disease could be devised, was only completed in 1895, by the admirable researches of Brefeld in Germany.

4. During the first period of the study of smut as a disease of corn, from 1754 to 1832, the erroneous opinion prevailed that it was due to an excessive accumulation of sap in parts of the plant, thus causing tumors. During the second period of study, from 1832 to 1895, the smut fungus was recognized as the cause of the disease, but it was erroneously supposed that the spores infected the corn plant through the seedling by being planted with the seed. During the third period, from 1895 to the present time, it has been recognized that smut spores of corn, unlike those

of some other cereals, grow at any time during the warm season, produce much smaller, secondary spores (conidia), which carried by the air infect the corn plant at any part of its surface that is in a sufficiently tender and growing condition, and that the disease is localized in the immediate vicinity of the infection.

5. The spores germinate upon the ground, or wherever warmth, moisture and soluble food material are available. They grow slowly, or not at all, in pure water, but develop luxuriantly in drainings from manure and other solutions containing plant food. They grow as mold or as yeast grows, and form numerous minute colorless delicate sporules, known as conidia. The conidia are blown about, and lighting on the growing corn plant cause infection by sending a slender outgrowth into the plant, which in the course of 10 to 14 days, develops into a smut pustule.

6. The corn plant is not infected through the seed or seedling, but upon any part of its surface, and at any time, throughout the season, wherever and whenever the surface tissues are delicate and in a growing condition. The infection is from flying conidia, and the result of infection is local, not given to spreading internally from one part of the plant to another.

7. The smut fungus produces countless numbers of spores, which appear black when ripe. The spores are capable of growth as soon as mature, and at any time for a year or more afterward. Infection in the field largely comes from conidia discharged into the air by spores which are growing upon the ground.

8. The smut pustules appear upon all parts of the plant above ground. The nodes of the stem retain their soft growing condition longer than the other parts of the plant, a character they have in common with other members of the grass family, and in consequence are often the seat of the disease, the frequency also being increased by the aid afforded by the leaf sheaths. The kernels of the ear are infected through the young extruded silk, and being rich in nutriment, give rise to the largest masses of smut upon the plant.

9. The number of pustules increases as the season progresses. The longer the season of growth, the greater the number of chances for infection, hence early planted corn will usually be more smutted than late planted corn.

10. Moist or rich soil, or other conditions that induce vigorous growth and softness of tissues, increases the chances for infection.

11. A moist atmosphere is necessary for the spread of the disease. Infection largely occurs during cloudy days, or dewy nights. Rain, unless at the beginning of a shower, interferes with infection, as it washes the conidia out of the atmosphere. Hence, a rainy season sometimes shows less smut in the corn crop than a dry season, the latter having occasional cloudy weather and frequent moist nights. Thickly planted corn main-

tains moister air between the plants and thus promotes the smut, as will other sheltering means.

12. Spraying the plants with some fungicide, especially Bordeaux mixture, has been found to largely prevent the smut, except in the ears, but it is deemed too troublesome and expensive for farm practice.

13. The present remarkably complete knowledge of the habits of the smut fungus leaves but one way open, so far as we can now see, for exercising a practical control over the disease. The source of infection must be removed by gathering and destroying the smut pustules before the spores are scattered.

14. Smut pustules should be collected before the corn is ripe, as well as at cutting and husking time, and destroyed by burning or placing in boiling water. The more thoroughly and persistently this is done, the more completely smut in the field will be suppressed. It is believed that the result will fully justify the trouble and expense.

15. The widespread belief in the poisonous character of corn smut is proven experimentally to have but scant basis in fact; and most of the reported instances of injury from eating smut were unquestionably due to other causes.

16. As a drug, corn smut acts on the brain and spinal cord, producing convulsions and paralysis, and during pregnancy some uterine contraction in which lies the possibility of abortion; but with animals under ordinary conditions these results so rarely follow the eating of smut in almost any quantity, as to be practically unknown.

17. Smut is proven by analysis to have a high nutritive value, and observation shows that when judiciously fed, cattle relish it and thrive upon it.

18. Whether smut spores can pass through the alimentary tract without losing their power of germination is uncertain, but probably not, in most instances. Smut spores, when eaten by animals are doubtless, in large part, or wholly, killed, although their microscopic appearance may remain practically unchanged.

19. Nutritive materials accompanying the spores are undoubtedly digested in part by the animal, but the extent to which the contents of the spores themselves are digested remains undetermined.

20. The intimate character of the active principle in corn smut and the full reasons why animals are rarely affected by it, are not yet discovered.

BIBLIOGRAPHY.

The following works have been consulted in the preparation of this paper. In addition to the works which have been seen and read by the writers, some were available only through abstracts; these are indicated by a (||), and a few only known to us by title, which are marked with an asterisk (*). Numbers in Roman numerals stand for volumes, those fol-

lowing colons for pages. When page numbers are joined by a hyphen, the matter extends from one to the other, when separated by a colon the matter occurs only on the pages named.

Arthur, J. C.—Report of the botanist, Rep. Ind. Exper. Sta. for 1891: 23-24. 1892.

Arthur, J. C.—Treatment of corn smut, Newspaper Bull. Ind. Exper. Sta. No. 16. Nov., 1895.

Arthur, J. C.—Report of the botanical department, Rep. Ind. Exper. Sta. for 1895: 24-26. 1896.

Arthur, J. C.—The common Ustilago of maize, Bot. Gaz. xxiii: 44-46. 1897.

Arthur, J. C.—Formalin for grain and potatoes, Bull. Ind. Exper. Sta. No. 77: 38-44. March, 1899.

Aymen.—Recherches sur les progres et la cause de la nielle, Mem. Acad. Sci. Paris, iii: 68-85. 1760.

Aymen.—Second memoire sur les maladies des bles, Mem. Acad. Sci. Paris, iv: 358-398. 1763.

Beal, W. J.—Indian corn, Rep. Mich. Board Agric. for 1880: 288. 1880.

||Beck, G.—Versl. Medel. K. Akad. Wet. Amsterdam iii: 115-122. 1865.
Abs. in Jour. Roy. Micr. Soc. for 1886: 489.

Beckmann, J.—Des Herrn Tillet Beobachtung einer Krankheit des turkischen Weizens oder des Mais, Hannoverisches Magazin vi: 1329-1340. 1768.

Beckmann, J.—Grundsätze d. deutsch. Landw. 4th ed.: 146. Gottingen 1790. Same, 6th ed.: 190. 1806.

*Beckmann, J.—Biblioth. Physic. Oeconom, vii: 135.

Berkley, M. J.—Gard. Chron. for 1850: 675.

Bessey, C. E.—The smut of Indian corn, Bull. Iowa Agric. College for Nov., 1884: 127-129.

Bessey, C. E.—The smut of Indian corn, Bull. Neb. Exper. Sta. No. 11: 25-35. 1889. Reprinted in Bull. Ohio Exper. Sta. No. 10: 264-272. 1890.

Blair, E. S.—Ustilago maidis, Therap. Gaz. Detroit xvii: 291-292. 1893.

Bonafous, M.—Histoire naturelle, agricole et economique du Mais: 94-99. Paris, 1836. Partial English trans. in Bull. Kans. Exper. Sta. No. 62: 102-194. 1896.

Bonnet, Ch.—Recherches sur l'usage des feuilles: 327-330. Gottingen, 1754.

*Bosc, J. A.—Dict. rais. d. Agric. iv: 65-66. Abs. in Ann. Sci. Nat. ser. 3. vii: 24. 1847.

- Brefeld, O.**—Die Brandpilze Bot. Unters. Heft 5: 67-75. Leipzig, 1883.
Abs. in Oesterr. bot. Ztschr. for 1883: 267; Jour. Roy. Micr. Soc. ii: 877.
1883; Gard. Chron. for 1889: 267-268; Amer. Nat. xxx: 224-226. 1896.
- Brefeld, O.**—Neue Untersuchungen über die Brandpilze und die Brandkrankheiten II, Nachr. aus d. Klub d. Landw. Berlin 1888: 1577-1584, 1588-1593, 1598-1601. English trans. by E. F. Smith in Jour. Myc. vi: 1-8, 59-71, 153-164. 1890-91. Abs. in Gard. Chron. for 1888: 396-397 and for 1889: 267-268; Bot. Centr. xxxix: 15-18. 1899; Just's Bot. Jahresb. for 1888, xvi: 318. 1890; Bot. Centr. Beihefte 1: 63. 1892.
- Brefeld, O.**—Infectionen mit Maisbrandconidien, Unters. aus d. Gesamtmgt. d. Myk. Heft 11: 52-92. Munster, 1895. Abs. in Bot. Centr. lxi: 273-281. 1895; Hedw. xxxiv: 138-140. 1895. Amer. Nat. xxx: 137-142. 1896.
- Buckhout, Wm.—A.**—Rep. Penn. Exper. Sta. for 1891: 179-180. 1892. Abs. in Exper. Sta. Rec. v: 61. 1895.
- Burger, J.**—Abhandlung über die Naturg. Cultur u. Benutz. des Mais: 242-243. Wien, 1809. Abs. in Bull. Kans. Exper. Sta. No. 62: 191. 1896.
- ***Burt, W. H.**—Monograph on *Ustilago maidis*, its physiologico-pathological effects, together with its uses in disease. Detroit, (1868?).
- ***Carradori, G.**—Giorn. Pisa vii: 301, and x: 265.
- Chestnut, V. K.**—Ann. Rep. Bureau Animal Industry for 1898: 388, 393, 419. 1899.
- Chevalier, F. F.**—Flore gen. environs Paris: 403. Paris, 1826.
- ***Clos,**—Recherches sur le charbon du Mais, Jour. Agric. prat. 1871.
- Collier, Peter**—See Parsons.
- Corda, A. K. J.**—Icon. fung. iv: 9. 1840. Same v: 3. 1842.
- Cressler, C. H.**—On the ergot of Indian corn, Amer. Jour. Pharm. xxxiii: 306-309. 1861.
- ***Cugini, G.**—Sulla vegetazione delle crittogame parassite delle coltivazioni Ann. Soc. Agr. Bologna xvi. 1876. Abs. in Nuova Giorn. Bot. Ital. for 1877: 109.
- D'Arbois, A. and Vesque, J.**—Les Maladies Pl. Cult.: 150-151. Paris, 1878.
- DeBary, A.**—Unters über die Brandpilze: 4-8. 1853.
- DeCandolle, A. P.**—Phys. vegetale iii: 1453. 1832.
- DeCandolle, A. P.**—See Lamarck and DeCandolle.
- DeToni, J. B.**—Saccardo's Sylloge fungorum vii: 473. 1888.

/

Dorland, W. A. N.—*Ustilago maydis*, a study of the drug with reference to its employment as an oxytoxic, *Med News* 11:534-536. 1887.

Duby, J. E.—*Bot. Gall.* 11:901. Paris, 1830.

Duchesne, E. A.—*Traite du Mals ou ble de Turquie*: 59-69. Paris, 1833.

||Dulong, M.—*Jour. de Pharm.* xiv:556. 1828. Abs. in *Ann. der Pharm.* 1:178. 1832.

Earle, F. S.—See Underwood and Earle.

Farmers' Bulletin No. 69: 18-20. Washington, 1898.

Figulier, L.—*The vegetable world*: 269-270. New York, 1867.

*Firth, L. B.—*Therap. Gaz. Detroit*, 7:101. 1883.

Fischer, J. L.—See Rademaker and Fischer.

||Fischer de Waldheim, A.—*Sur le structure des spores des Ustilaginees*, *Bull. Soc. Imp. Nat. Moscou*. 1867. Abs. in *Hedw.* vi: 166-170. 1867; *Bot. Zeit.* xxv: 393. 1867.

||Fischer de Waldheim, A.—*Beitrage zur Biologie und Entwicklungsgeschichte der Ustilagineen*, *Pringsh, Jahrb. f. wiss. Bot.* vii —. 1869. English trans. in *Rep. N. Y. Agric. Soc. for 1870*: 280-354. 1871. Abs. in *Hedw.* ix: 91-95. 1870.

Frank, A. B.—*Die Krankheiten der Pflanzen*: 431. Breslau, 1890.

Gamgee, J.—*Ill effects of smut in the feed of farm animals*, *Rep. Com. Agric. on Diseases of Cattle in U. S.*: 73-81. Washington, 1871.

Georgeson, C. C.—*Treating seed corn with creosote for smut*, *Bull. Kans. Exper. Sta. No. 30*:202-203. 1891.

Giersberg, Fr.—*Krankh. d. Landw. Culturpfl.*: 23. Berlin, 1878.

||Gibelli, G.—*Studi sulla moltiplicazione artificiale delle cryttogame parassiti dei cereali*, *Atti R. Acad. Sci. Modena* xvii:—. 1877. Abs. in *Just's Bot. Jahresh.* for 1877: 97-98. 1879.

Goff, E. S.—*Corn smut*, *Tenth Rep. Wis. Exper. Sta. for 1893*: 246-247. 1894.

Hahn, J. H.—*Corn smut*, *Amer. Jour. Pharm.* lili: 496. 1881. Abs. in *Just's Bot. Jahresb.* for 1881: (Pt. II.) 670. 1884.

Halsted, B. D.—*From grain to ear*, *Rep. Mass. Bd. Agric. for 1882*: 79-80. 1883.

Halsted, B. D.—*Rep. N. J. Exper. Sta. for 1896*: 352. 1897.

||Hartsen,—*Sur les caracteres chimiques de l'Uredo du Mais*, *Compt. rend.* 1874: 441-442. Abs. in *Just's Bot. Jahresb.* for 1874: 248. 1876.

- ||Haselbach,—Mag. f. Tierheilkunde, von Gurlt u. Hertwig, 1860:—. Abs. in Zurn und Plant's Die pflanzlichen Parasiten auf und in dem Korper unserer Haussaugetiere: 68 footnote. 2nd edition. Welmer, 1887.
- Henry, W. A.—Rep. Regents Wis. Univ. for 1881: 46-54. 1882. Abs. in reference to feeding smut to cows in Trans. Wis. Agric. Soc. for 1881-2: 278-280. 1882; Tenth Rep. Wis Exper. Sta. for 1893: 81-83. 1894; Breeder's Gaz. xxvi: 240. 1894.
- Henry, W. A.—Corn smut, First Rep. Wis. Exper. Sta. for 1883: 25-27. 1884.
- Henry, W. A.—Smut upon corn and timothy, Breeder's Gaz. xiv: 360-361. 1888.
- Hickman, J. F.—See Selby and Hickman.
- Hitchcock, A. S.—Variation in spores of corn smut, Science 22: 353. 1893.
- Hitchcock, A. S. and Norton, J. B. S.—Corn smut, Bull. Kans. Exper. Sta. No. 62: 162-212. 1896.
- Hitchcock, A. S.—Note on corn smut, Bot. Gaz. xxviii: 429-430. 1899.
- Humphrey, J. E.—Ninth Rep. Mass. Exper. Sta. for 1891: 246-247. 1892.
- Imhof, J.—Zea Maydis morbus ad ustilaginem vulgo relatus: 1-36. Argentorati, 1784.
- Kellerman, W. A.—Experiments with corn smut, Bull. Kans. Exper. Sta. No. 23: 101-104. 1891.
- Knowles, E. L.—Abnormal structure induced by Ustilago Zeae Mays, Jour. Myc. v: 14-18. 1889.
- Kuhn, J.—Die Krankheiten der Kulturgewachse: 70-76, 260. Berlin, 1858.
- Kuhn, J.—Mittheilungen uber die Entwicklungsformen des Getreidebrandes: Halle.
- Kuhn, J.—Entwicklungsgeschichte des Maisbrandes, Hedw. ii: 5-7. 1858.
- ||Kuhn, J.—Ueber die Entwicklungsformen des Getreidebrandes und die Art des Eindringens der Keimfaden in die Nahrpflanze, Sitzber. d. nat. Ges. Halle, 1874:—; Centr. f. Ag. chem. 1874: 150-153; Bot. Zeit. 1874: 121-124; Just's Bot. Jahresb. for 1874: 247-248. 1876.
- ||Kuhn, J.—Ueber die an dem Grunmais und Futtersorghum vorkommenden Brandformen, Fuhl. Landw. Zeit. xxviii: 81. 1879. Abs. in Just's Bot. Jahresb. for 1879: 564-565. 1883.
- Lamarck, J. B. and DeCandolle, A. P.—Fl. Franc. ii: 596. Same, iii: 98-99. Paris, 1805.

- Lamarck, J. B. and DeCandolle, A. P.—Encyl. Meth. Bot. viii:227. Paris, 1808.
- Lamarck, J. B. and DeCandolle, A. P.—Fl. Franc. vi: 77. Paris, 1815.
- ||Leonard, C. H.—New Preparations. Abs. in Amer. Jour. Pharm. xlix: 189. 1877.
- Leveille, J. H.—Recherches sur le developpement des Uredinees. Ann. Sci. Nat. 2nd ser. xi: 13-14. 1839.
- Leveille, J. H.—Sur la disposition methodique des Uredinees. Ann. Sci. Nat. 3rd ser. viii: 373-376. 1847.
- ||Leveille, J. H.—Le bon Jardinier for 1855: 249. Abs. in Prillieux's Mal. Pl. Agric. i: 174. 1895.
- Magnus, P.—Seit wann ist der Maisbrand in Mittel Deutschland? Deutsch. Bot. Monatsschr. xiii: 49-53. 1895.
- Magnus, P.—Die Ustilagineen der Provinz. Brandenburg. Abh. bot. Ver. Brand. xviii: 72-73. 1896.
- Mayo, N. S.—Bull. Kans. Exper. Sta. No. 58: 68-70. 1896.
- *Meyen, F. J. F.—Ueber die Entwicklung des Getreidebrandes in den Mais Pflanzen, Wieg. Arch. iii: 419-421. 1837.
- Meyen, F. J. F.—Pflanzen Pathologie: 101-104. Berlin, 1841.
- *Miles, C. E.—Ustilago maidis as an oxytocic, Mass. Eclect. Jour. Boston, for 1881: 241-245.
- Mitchell, James—Physiological action of Ustilago maidis on the nervous system, Therap. Gaz. Detroit x: 223-227. 1886.
- Moore, V. A.—Bull. U. S. Bureau Animal Industry No. 10: 11-13. 15-16. 47-49. 1896.
- ||Morini, F.—Il carbone delle piante, Clin. Veterin. vii: —. 1884. Abs. in Bot. Centr. xxi: 367. 1885; Sorauer's Handb. d. Pflanzenkr. ii: 208. 2nd ed. Berlin, 1886; Prillieux's Mal. Pl. Agric. i: 174. 1895.
- ||Morini, F.—Mem. Acad. Sci. Bologna vi: 283-290. 1886. Abs. in Jour. Roy. Micr. Soc. for 1888: 269.
- Norton, J. B. S.—A study of the Kansas Ustilagineae especially with reference to their germination. Trans. Acad. Sci. St. Louis, vii: 234-235. 1896.
- Norton, J. B. S.—See Hitchcock and Norton.
- Pammel, L. H.—Corn smut, Proc. Iowa Acad. Sci. for 1891, i: (P. 2)95. 1895. Abs. in Bull. Iowa Exper. Sta. No. 16: 315-324. 1892.
- Pammel, L. H. and Stewart, F. C.—Prevention of corn and oats smut. Bull. Iowa Exper. Sta. No. 20: 726-728. 1893.

- Panton, J. H.**—Bull. Ontario Agric. Coll. No. 56: 4-6. 1890.
- Parmentier, A. A.**—Le Mais ou ble de Turquie, Mem. Acad. Roy. Sci. Bordeaux 1784: 31-35. 1785. Same in a separate and revised edition 49-57. Paris, 1812.
- Parsons, H. B.**—Analysis of corn smut (in report of the chemist, Peter Collier), Rep. U. S. Dept. Agric. for 1880: 136-138. 1882. Also in New Remedies xi: 80-82. 1882.
- Peck, Charles H.**—Rep. N. Y. Mus. xxii: 92-93. 1868. Same, xxxiv: 26-28. 1881.
- Peters, A. J.**—Corn stalk disease, Bull. Neb. Exper. Sta. No. 52: 52-54. 1898.
- *Phillippar, F.**—Hist. nat. du Mais:—. 1837.
- Plowright, C. B.**—British Ured. and Ustilagineae: 58-118. London, 1889.
- Plumb, C. S.**—Diseases, Indian Corn culture: 147-153. Chicago, 1895.
- Prillieux, Ed.**—Maladies des plantes agricoles, i: 170-175. Paris, 1895.
- ||Rademaker, C. J. and Fischer, J. L.**—Ustilagine, Med. Herald for 1887: 775. Also in Nat. Druggist for 1887:—, and in Jour. Pharm. xviii: 156. 1887. Abs. in Journ. de Pharm. et Chem. xvi:359. 1887; Amer. Journ. Pharm. lviii:445. 1887; Just's Bot. Jahresb. for 1887, Abth. 1: 522 and Abth. 2: 500. 1889.
- ||Re, F.**—Fungo del maiz, Saggio teorico-pratico sulle malattie delle piante: 187. Venezia, 1807. Cited by DeCandolle, Phys. Veg. iii: 1454. Paris, 1832.
- ||Renner, A.**—Ar. uszobetegseg, Foldm. Erd. vii:—. 1879. Abs. in Just's Bot. Jahresb. for 1879:564. 1883; Jour. Roy. Micr. Soc. for 1880: —; Amer. Nat. for 1880: 365.
- ||Roulin,—**De l'ergot du Mais et de ses effets sur l'homme et les animaux, Acad. Sci. Paris. 1829. Also in Ann. Sci. Nat. xix: 282. 1830. Abs. in Duchesne's Traite du Mais: 64-67. Paris, 1883.
- Satterlee, Jas.**—Corn mixed with smut, Rep. Mich. Board Agric. for 1883: 45. 1884.
- Schroeter, J.**—Krypt. Fl. von Schlesien, Pilze i: 271. Breslau, 1889.
- Schroeter, J.**—Die Brand und Rostpilze Schlesiens, Abh. d. Schles. Ges. nat. for 1869: —.
- Schweinitz, L.**—Synopsis fungorum Carolinae superioris, Schriften d. Nat. Ges. Leipzig i: 71. 1822.
- Schweinitz, L.**—Synopsis fungorum in America Boreali, Trans. Amer. Phil. Soc. iv: 290. 1834.

Scribner, F. L.—See Seymour.

Selby, A. D. and Hickman, J. F.—Corn smut, Bull. Ohio. Exper. Sta. No. 78: 92-96. 1897.

Seymour, A. B.—Smut of Indian corn (in Report of the section of vegetable pathology by F. L. Scribner), Rep. U. S. Dept. Agric. for 1887: 380-389. 1888.

Seymour, A. B.—Amer. Gard. xi: 278. 1890.

Smith, Clinton, D.—Feeding corn smut to dairy cows, Bull. Mich. Exper. Sta. No. 137: 41-46. 1896.

Sorauer, P.—Handbuch der Pflanzenkrankheit: 264-266. Berlin, 1874.

Sorauer, P.—Handb. d. Pflanzenkr. ii: 201-208. 2nd edition. Berlin, 1891.

Spalding, V. M.—Ustilago maydis and related species. Therapeutic Gaz. Detroit v:121-125. 1881. Abs. in Just's Bot. Jahresb. for 1881: 691 1884.

Stewart, F. C.—Effects of heat upon the germination of corn and smut. Proc. Iowa Acad. Sci. for 1894, ii: 74-78. 1895.

Stewart, F. C.—See Pammel and Stewart.

Stuart, Wm.—Fungicides for the prevention of corn smut, Proc. Ind. Acad. Sci. for 1895; 96-99. 1896.

*Swiecicki—Ustilago maidis in der Geburtshilfe, Therap. Monatsschr. ii: 171. Berlin, 1888.

*Taylor, Robert A.—Inaug. Thesis Jefferson Med. College, 1886.

Thomas, M. B.—Some field experiments with formalin, Proc. Ind. Acad. Sci. for 1898: 62-64. 1899.

Tillet, M.—Observation sur la maladie du Maïs ou ble de Turquie, Mem. Acad. Sci. Paris for 1760: 254-261. 1766. Abs. in Hist. Acad. Sci. Paris for 1760: 85-89. 1766. (The Historie and Memoires of this year form one volume with a single title page and table of contents, but separately paged. The volume is without number.) German trans. by Beckmann, Hannov. Mag. vi:1329-1340. 1768.

Trelease, Wm.—Beal's Grasses of N. Amer. i: 414. 1887.

Tubeuf, C. v.—Zeitschr. f. Pflanzenkr. iii:203. 1893.

Tulasne, L. and C. H.—Ann. Sci. Nat. 3rd ser. vii: 14-126. 1847.

Underwood, L. M. and Earle, F. S.—Treatment of some fungous diseases. Bull. Ala. Exper. Sta. No. 69: 253-254. 1896.

Unger, F.—Die Exantheme der Pflanzen: 350. Wien, 1833.

Unger, F.—Ueber den Einfluss des Bodens: 211. Wien, 1836.

- Unger, F.—Anat. und Phys. d. Pflanz.: 129. 1855.
- Utz, Henry B.—A treatise on a new and infallible mode of improving the quality of Indian corn: 4-5. Corydon, Indiana, 1894.
- Wallroth, K. F. W.—Fl. Crypt. Germ: 215. 1833.
- Ward, Marshall H.—Smut fungi, Gard. Chron. for 1889: 233-235, 267-268.
- Winter, G.—Krankh. der Kultur-Gewachse: 129-130. Leipzig, 1878.
- Winter, G.—Rabenh. Krypt. Fl. Deutschl. Pilze 1: 97. 1881.
- Wolff, R.—Der Brand des Getreides. Inaug. Diss. 10-11, 18-24. Halle, 1874. Abs. in Just's Bot. Jahresb. for 1873: 84-86. 1874.
- Wolff, R.—Krankh. der landw. Nutzpfl.: 44. Berlin, 1887.
- Wood, H. C.—Ustilago, Dispensatory of U. S. of Amer.: 1766. 17th ed. Philadelphia, 1896.

To the above list of citations may be added the following references to more ephemeral publications, mostly agricultural. These contain matter of more or less value relating to corn smut, in part written by persons uninformed regarding the opinions of scientific men.

- Amer. Agriculturist xxxix:447. 1880. xl:319. 1881.
- Amer. Corn and Hog Journal, No. 8, 1895.
- Agric. Epitomist March, 1893.
- Amer Farmer, Sept., 1861.
- Amer. Gardening, ix:289. 1890. xi: 241. 1891.
- Breeder's Gaz. xxvi: 340. 1894. xxviii:327. 1895.
- Country Gentleman, xxv:43, 125. 1865. xxxii:275. 1868. xxxiv:275. 1869. xli:549, 795. 1876. xliii:584. 1878. xlv:76, 107, 139, 236. 1880. xlvii: 579. 1881. lv:323. 1890. v:187. 1892.
- Farmer's Guide for 1898: 642.
- Ind. Agric. Report for 1856: 354. 1890: 163-165.
- Indianapolis Jour., Dec. 9, 1898.
- Mass. Agric. Report for 1876-7: 162. 1880:99-101, 106. 188:206.
- Mich. Agric. Report for 1850: 118. 1857: 261, 272. 1884: 200.
- Ohio Agric. Report for 1878: 345-346.
- Pop. Gardening, iii: 276-277. 1887-8. iv: 208. 1888-9.

LIST OF TREES AND SHRUBS ON THE GROUNDS OF PURDUE UNIVERSITY.

ARRANGED BY PIERRE VAN LANDEGHEM, UNIVERSITY FLOREST AND LANDSCAPE
GARDNER.

This list is published as of special interest, in view of the fact that the winter of 1898-99 was one of the severest in many years, on trees in Indiana. All the trees, shrubs and vines enumerated below withstood the severity of the worst weather.

DECIDUOUS TREES.

<i>Generic and Specific Names.</i>	<i>English or Common Names.</i>
<i>Acer campestre</i>	Maple, European.
<i>Acer dasycarpum</i>	Maple, American Silver
<i>Acer ginnale</i>	Maple, Small Leaved, Siberian.
<i>Acer platanoides</i>	Maple, Norway.
<i>Acer pseudo platanus</i>	Maple, Sycamore.
<i>Acer rubrum</i>	Maple, Red or Swamp.
<i>Acer saccharinum</i>	Maple, Sugar or Rock Maple.
<i>Acer Schwedlerii</i>	Maple, Purple Norway.
<i>Acer Wierii</i>	Maple, Silver Cat-Leaved.
<i>Ailanthus glandulosa</i>	Japanese Tree of Heaven.
<i>Castanea Americana</i>	Sweet Chestnut.
<i>Æsculus glabra</i>	Horse Chestnut.
<i>Æsculus flava</i>	Yellow Buckeye.
<i>Betula alba</i>	Birch, European White.
<i>Betula alba laciniata</i>	Birch, Eu. Silver Cat-Leaved Weeping.
<i>Betula lutea</i>	Birch, American Yellow.
<i>Betula papyracea</i>	Birch, American Paper Barked Canoe.
<i>Betula atropurpurea</i>	Birch, European, Purple Leaved.
<i>Betula rubra</i>	Birch, American Red Barked.
<i>Carya amara</i>	Hickory, American Bitternut Hickory.
<i>Catalpa Kampferii</i>	Japanese Catalpa.
<i>Catalpa speciosa</i>	Western Catalpa.
<i>Celtis occidentalis</i>	American Nettle Tree.
<i>Cercis Canadensis</i>	Judas Tree.
<i>Cladrastis tinctoria</i>	American Yellow Wood.
<i>Crataegus coccinea</i>	American White Thorn.

DECIDUOUS TREES—(Continued.)

<i>Generic and Specific Names.</i>	<i>English or Common Names.</i>
<i>Elaeagnus hortensis</i>	American Silver Thorn.
<i>Fagus Americana</i>	American Silver Beech.
<i>Fagus Riversii</i>	American Blood Leaved Beech.
<i>Fraxinus Americana</i>	American White Ash.
<i>Fraxinus excelsor</i>	English Ash.
<i>Fraxinus ornus</i>	English Flowering Ash.
<i>Fraxinus quadrangulata</i>	American Blue Ash.
<i>Fraxinus sambuscifolia</i>	American Black Ash.
<i>Fraxinus viridis</i>	American Green Ash.
<i>Gleditschia triacanthos</i>	American Honey Locust.
<i>Gymnocladus Canadensis</i>	American Kentucky Coffee Tree.
<i>Juglans cinerea</i>	American Butternut.
<i>Juglans nigra</i>	American Black Walnut.
<i>Larix Europea</i>	European Larch.
<i>Liriodendron tulipifera</i>	Amer. Tulip Tree, White Wood, Poplar.
<i>Liquidambar styraciflua</i>	American Sweet Gum.
<i>Magnolia acuminata</i>	American Cucumber Tree.
<i>Morus alba</i>	American Mulberry.
<i>Negundo aceroides</i>	American Ash Leaved Maple.
<i>Nyssa multiflora</i>	American Sour Gum.
<i>Ostrya Virginica</i>	American Ironwood.
<i>Planera cuspidata</i>	American Elm Leaved Plane.
<i>Platanus orientalis</i>	Eastern Plane Sycamore.
<i>Populus alba</i>	American Silver Poplar.
<i>Populus balsamifera</i>	American Balsam Poplar.
<i>Populus bolleana</i>	American Silver Barked Poplar.
<i>Populus fastigiata</i>	European Lombardy Poplar.
<i>Populus monilifera</i>	American Necklace Poplar.
<i>Populus tremuloides</i>	American Aspen Poplar.
<i>Pyrus aucuparia</i>	European Mountain Ash.
<i>Quercus alba</i>	American White Oak.
<i>Quercus coccinea</i>	American Scarlet Oak.
<i>Quercus macrocarpa</i>	American Mossy Cup or Burr Oak.
<i>Quercus palustris</i>	American Pin or Water Oak.
<i>Quercus tinctoria</i>	American Black Oak.
<i>Rhamnus cathartica</i>	American Common Buckthorn.
<i>Robinia hispida</i>	American Rose Acacia.
<i>Salisburia adiantifolia</i>	Japanese Gingko or Maiden Hair Tree.
<i>Salix babylonica</i>	Babylonian Weeping Willow.
<i>Salix pentandra</i>	European Laurel Leaved Willow.
<i>Salix discolor</i>	Pussy Willow.
<i>Prunus serotina</i>	American Wild Black Cherry.

DECIDUOUS TREES—(Continued.)

<i>Generic and Specific Names.</i>	<i>English or Common Names.</i>
<i>Sophora japonica</i>	Japanese Sophora, Green Barked.
<i>Tilia Americana</i>	American Linden or Basswood.
<i>Tilia Europæa</i>	European Linden.
<i>Tilia Europea argentea</i>	European Linden, Silver Leaved.
<i>Tilia platyphylla</i>	American Linden, Large Leaved.
<i>Tilia rubra laciniata</i>	European Linden, Red Tinged.
<i>Ulmus Americana</i>	American White Elm.
<i>Ulmus campestre</i>	European English Elm, Small Leaved.
<i>Ulmus fulva</i>	American Slippery or Red Elm.
<i>Ulmus racemosa</i>	American Cork Elm or Rock Elm.
<i>Xanthoxylum fraxineum</i>	American Prickly Ash.

DECIDUOUS SHRUBS AND VINES.

<i>Generic and Specific Names.</i>	<i>English or Common Names.</i>
<i>Akebia quinata</i>	Japanese Five Leaved Akebia.
<i>Ampelopsis quinquefolia</i>	American Virginia Creeper or Ivy.
<i>Ampelopsis Veichii</i>	Japanese Five Leaved Ivy.
<i>Amygdalis nana</i>	Russian Flowering Almond.
<i>Berberis purpurea</i>	European Purple Barberry.
<i>Berberis vulgaris</i>	American Common Barberry.
<i>Calycanthus floridus</i>	American Sweet Scented Shrub.
<i>Caragana arborescens</i>	Siberian Yellow Pea.
<i>Celastrus scandens</i>	American Bittersweet.
<i>Chionanthus Virginica</i>	American White Fringe.
<i>Clematis flammula</i>	European Sweet Virgin Bower.
<i>Clematis Jackmanii</i>	European Purple Virgin Bower.
<i>Colutea arborescens</i>	European Bladder Senna.
<i>Corchorus Japonica</i>	Japanese Yellow Flowering Kerria.
<i>Cornus Japonica</i>	Japanese Yellow Flowering Kerria.
<i>Euonymus sanguinea</i>	English Red Twigged Dogwood.
<i>Forsythia atropurpurea</i>	American Burning Bush.
<i>Forsythia Fortunei</i>	Chinese Golden Bell.
<i>Forsythia viridissima</i>	Chinese Golden Bell.
<i>Halesia tetraptera</i>	American Silver Bell.
<i>Hibiscus syriacus</i>	Syrian Rose of Sharon.
<i>Hibiscus ranunculæflora</i>	Syrian Rose of Sharon.
<i>Hydrangea paniculata</i>	American Hydrangea.
<i>Ligustrum vulgare</i>	American Privet.
<i>Lonicera grandiflora</i>	Russian Honeysuckle.
<i>Lonicera tartarica</i>	Tartarian Honeysuckle.
<i>Lonicera xylosteum</i>	English Fly Honeysuckle.
<i>Paeonia Banksia</i>	Chinese Purple Paeony.

DECIDUOUS SHRUBS AND VINES—(Continued.)

<i>Generic and Specific Names.</i>	<i>English or Common Names.</i>
<i>Paeonia rosea</i>	Chinese Pink Paeony.
<i>Philadelphus coronarius</i>	European Mock Orange.
<i>Philadelphus grandiflora</i>	Carolina Mock Orange.
<i>Pyrus Japonica</i>	Japonica. Japanese Quince.
<i>Ribes aureum</i>	American Yellow Flowering Currant.
<i>Spiraea prunifolia</i>	Chinese Prune Leaved Spiraea.
<i>Spiraea Reevesii</i>	European Reeve's White Spiraea.
<i>Spiraea salicifolia</i>	European Willow Leaved Spiraea.
<i>Syringa Emodii</i>	American Pink Flowering Spiraea.
<i>Spiraea Van Houttii</i>	Eu. Spiraea Van Houtte's White Spiraea.
<i>Styrax Japonica</i>	Japanese White Flowering Styrax.
<i>Syringa alba</i>	Persian White Lilac.
<i>Syringa Emodii</i>	Himalayan White Lilac.
<i>Syringa Lemoinii</i>	Persian Hybrid Lilac.
<i>Syringa Persica</i>	Persian Purple Lilac.
<i>Syringa vulgaris</i>	Persian Common Lilac.
<i>Viburnum opulus sterilis</i>	European Common Snow Ball.
<i>Viburnum plicatum</i>	Japanese Snow Ball.
<i>Weigela rosea</i>	Chinese Rose Flowering Weigela.

EVERGREEN OR CONIFEROUS TREES.

<i>Generic and Specific Names.</i>	<i>English or Common Names.</i>
<i>Abies balsamea</i>	American Balsam Fir.
<i>Juniperus Canadensis</i>	American Hemlock Spruce.
<i>Picea excelsa</i>	Norway Spruce.
<i>Pseudotsuga pungens</i>	Colorado Blue Spruce.
<i>Picea Douglasii</i>	Douglas Spruce.
<i>Pinus Virginiana</i>	American Red Cedar.
<i>Pinus austriaca</i>	European Austrian Pine.
<i>Pinus cembra</i>	Siberian Pine.
<i>Pinus densiflora</i>	Japanese Pine.
<i>Pinus excelsa</i>	Asia Bhotan Pine.
<i>Pinus inops</i>	American Jersey Pine.
<i>Pinus strobus</i>	American White Pine.
<i>Thuya sylvestris</i>	European Scotch Pine.
<i>Thuya globosa</i>	American Globe Arbor Vitae.
<i>Thuya occidentalis</i>	American Arbor Vitae.
<i>Thuya Siberica</i>	Siberian Arbor Vitae.

DESCRIPTION OF EXPERIMENT STATION PIGGERY.

H. E. VAN NORMAN.

The new piggery is located on the highest ground in lot C. of field 3. as shown on the farm map, corrected to November, 1898. The building occupies the south part of the lot and faces north.

The main part of the building is 22 by 46 feet outside. The long way north and south. On each side is a wing 12 by 14 feet.

From the front door a central alley, 6 feet wide, extends the entire length of the building. On the right side of this alley the first 18 feet is given up to feed chutes, mixing vat, scales for weighing experimental feed, water hydrant and a 5x6 foot Howe stock scale.

The remainder of the space on this side of the alley is divided into four feeding pens, each 7x8 feet.

Beginning at the front door, on the left, is a stairway leading to the second floor. Next, a room 8x11 feet, extending under the stairway, is fitted for an attendant to be comfortable at night, if necessary for him to stay with a farrowing sow. This room contains a stove and boiler for heating water and cooking feeds and it also affords place for pails, brooms, etc., and has a brick chimney.

The next space, 9x8 feet, is celled up to the ceiling, making a tight warm room for sows to farrow in. A window opens into the attendant's room. The remaining space on this side of the alley is divided into four pens, 7x8 feet, corresponding to the west side.

The wings on either side are divided into two pens 7x12 feet, are used for sleeping pens and open into the first two feeding pens. For the remaining pens sleeping quarters are provided in small shelter houses in each lot.

The front part, 22x32 feet, of the main building is two stories high, affording storage room for bedding, crates and bin room for feed. The remainder of the building, including wings, is one story high.

The foundation is of brick, 8 inches thick, and 18 inches deep, with the top just above the ground. The sills are 4x8 inches, No. 1 pine, while the studs are 2x6 inch No. 1 hemlock, 14 feet long, for the two story part, 2x4 inch 7 feet long for the one story part and 4½ feet long for the wings.

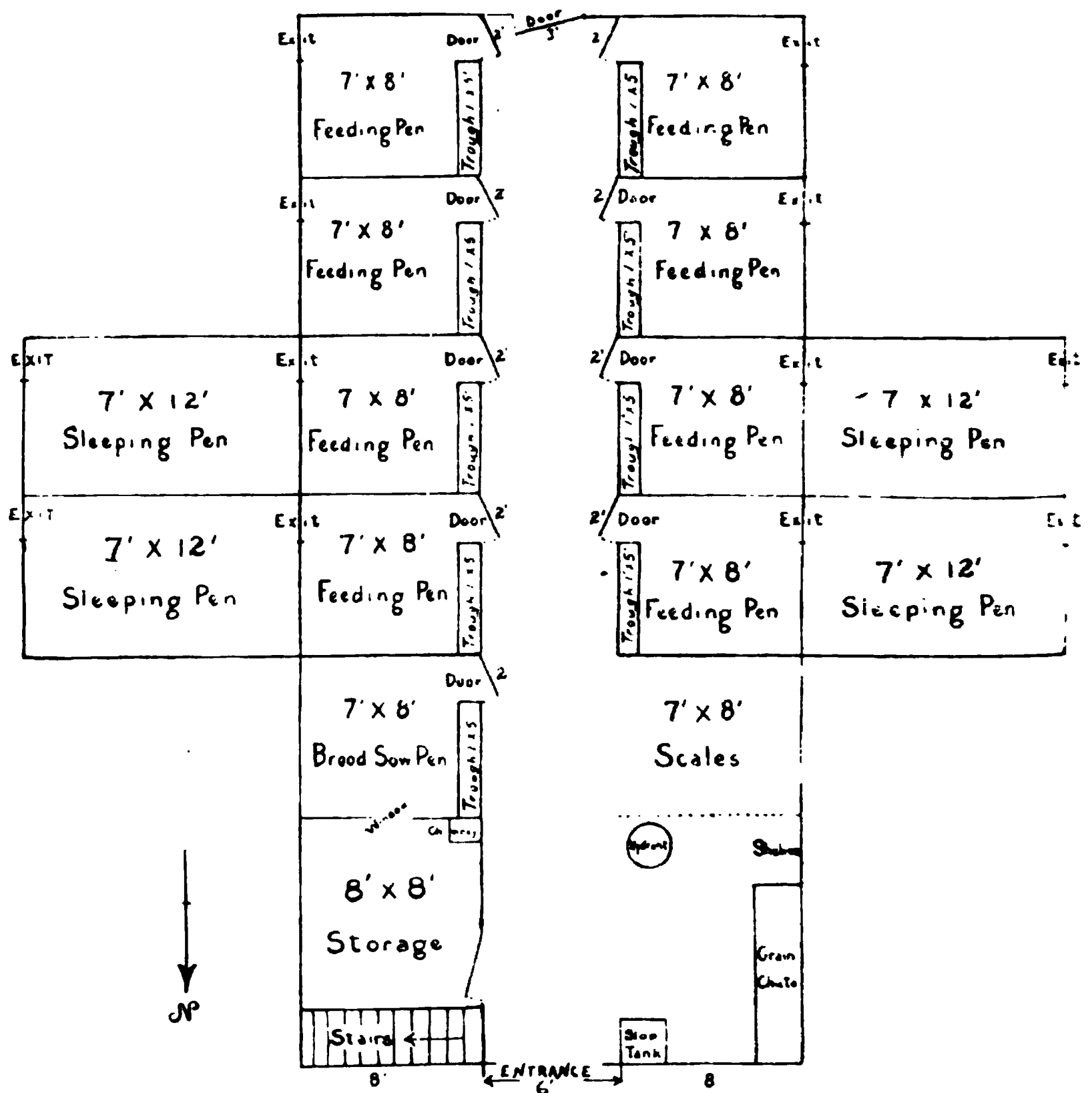
On the studding of the wings are nailed plain boards. On these is put No. 3 tarred building paper, over which the yellow pine drop siding is nailed. The remainder of the building has the same drop siding without any lining.

The rafters are laid 2 feet apart, from center to center, and are No. 1 hemlock, 2x4 inches, 16 feet long. The plate is 2x6 inch No. 1 hemlock.



with 2x4 inch hemlock on top, the two spiked together. The rafters are tied with cross braces 3 feet below the comb of the roof. There is also one tie rod through the center of the building to hold the plates from spreading.

The floor of the main building is of cement three inches thick. The bottom 2½ inches is grout made with Louisville cement, while the top ½



Floor Plan of Piggery at Purdue University.

inch is made with Portland cement. There are two gutters extending the length of the feeding pens, just inside of the front partition and emptying into the tile drains at the south end of the building.

There are three windows on the east side, two in each end and the

west side and one on each north and south side of the wings. These windows are all transom shape, having four panes of glass 10x12 inches, and hinged on the bottom side, opening in. The second story front has two windows of standard shape and size. There is also a door to receive feed onto this floor.

The front door downstairs is double, each being 3x6½ feet. The rear door is 4x6 feet.

The partitions between the pens are three feet high, made of ¾x6 inch hard pine flooring, nailed vertically on 2x4 inch oak stringers. The front partition on the west of the alley is the same as that between the pens, while the east side front is put on horizontally. The bottom four boards are cleated together and make a door which hung from the top permits it to be swung in to facilitate cleaning the floor and gutter.

Each pen has a door opening into the alley. These are plain batten doors uniform with the partitions. At the rear of each pen a door opens into the sleeping quarters, or lot, as the case may be. These are slide doors and are lifted by means of a rope running over pulleys to the front of the pen. Each pen has a galvanized iron, half round feeding trough. These troughs are five feet long, one foot wide, and six inches deep, are bound together with angle iron and have two strips of strap iron across the top to prevent spreading. These troughs are hinged to the front partition on the west side of the alley and to the swinging partition on the east side of the alley. This arrangement permits the easy cleaning of the floor and gutter.

The grain bin occupies a space 3½x8 feet on the second floor. It is 4 feet deep and has a cover. From the second floor line the front of the bin continues down to within 3 feet of the floor and 6 inches from the wall, leaving an opening 6 inches wide and 8 feet long. Six inches below this opening is a box 2 feet wide and 8 feet long, into which the feed empties, and from which it may be scooped out. This bin is divided into four compartments by means of three partitions extending from the top of the bin to the box below. In these bins all the feed will come down within reach of the feeder's scoop as it is removed from below.

On the roof of the building there is a cupola, with ventilating blinds. Extending from below the ceiling of the first story up into this cupola is a ventilating shaft 10x10 inches. It has a slide cut off to regulate the draft.

The building is fully equipped with gutters, down-spouts, and drainage.

The building is so placed as to be centrally located among a series of feeding lots, all of which are connected with the building by lanes leading up to it. Each lot contains a small house for sleeping quarters. See plate XIV.

Water is piped into the building from a central supply tank.

This building is not necessarily a model for the feeder or breeder of

hogs, as it was designed to meet the needs of the Experiment Station in its experimental feeding work. The general construction, however, offers numerous helpful suggestions to the pig feeder and from the sanitary and economic standpoints it presents a very desirable type of construction. Many details are the result of consultation and correspondence with some of the most successful swine breeders in the United States, and in so far as any of the details may meet the needs of the farmers or breeders, they are models, though the arrangement of the building as a whole may not be.

APPENDIX.

The following gifts have been made to the Station during the year, and to givers of these, thanks are herewith rendered:

W. H. Caldwell, Sec'y, Petersboro, N. H., Herd Register American Guernsey Cattle Club, Vol. 8.

F. L. Houghton, Sec'y, Brattleboro, Vt., Vol. XV, Holstein-Friesian Herd Book of America.

Alfred Mansell, Sec'y, Shrewsbury, England. Vol. XVI, English Shropshire Flock Book.

Carl Griegau, Sec'y, Dayton, Ohio. Vol. XX, Ohio Poland China Record.

A. P. Grout, Winchester, Ill. One Collie dog.

J. McLain Smith, Sec'y, Dayton, Ohio. Vol. X, Red Polled Cattle Herd Book.

C. R. Thomas, Sec'y, Independence, Mo. Vol. XIX, American Hereford Record.

Frank B. Hearne, Sec'y, Independence, Mo. Vols. V, VI, VII, VIII, IX, American Galloway Cattle Herd Book.

Robert J. Evans, Sec'y, El Paso, Ill. Vols. I, II, III, IV, National Duroc-Jersey Record.

A. V. Bradrick, Sec'y, Connersville, Ind. Vol. VIII, American Duroc-Jersey Record.

Herbert A. Jones, Sec'y, Himrods, N. Y. Vol. A, International Ohio Improved Chester White Swine Record.

Farmers' Guide Pub. Co., Huntington, Ind., Bound Copy of Vol. IX, Farmers' Guide for 1897.

Propaganda for the Use of Nitrate of Soda, New York City. Two sacks nitrate of soda.

Edward Sudendorf, Ag't, Elgin, Ill. One quart Wells-Richardson butter color.

W. Atlee Burpee, Philadelphia, Pa. Collection of varieties of flower and vegetable seeds.

B. F. Harris, Dull, Tenn. Package Harris' Earliest Watermelon seed.

S. J. Lehman & Co., Enon, Ind. 25 Lehman's No. 2 strawberry plants.

American Stock Food Co., Chicago, Ill. 100 lbs. American stock food.

Crown M'f'g Co., Phelps, N. Y. Repairs for Crown drill.

Henry E. Dooch, Sec'y, Portland, Oregon. Fifth Biennial Report Oregon State Board of Horticulture.

L. A. Godman, Sec'y, Westport, Mo. 41st Annual report Missouri State Horticultural Society.

German Kali Syndicate, New York City. Muriate of potash.

Wm. Henry Maule, Philadelphia, Pa. New seeding potato, No. XXX.

C. W. Middleton, Utica, Mo. 12 Livingston Raspberry plants.

Luther Burbank, Santa Rosa, Cal. Scions of Apple Plum, American Plum and Chalco Plum.

W. J. Hurst, Muncie, Ind. Seedling potatoes.

C. S. Pratt, Reading, Mass. 12 samples strawberry plants.

Amos Garretson, Pendleton, Ind. Eaton Raspberry plants.

J. H. Marion, Fulton, Mo. Seeds and scions of native persimmon.

W. D. Latshaw, Carlisle, Ind. Six Hoosier blackberry plants.

C. E. Wilkinson, Carmel, Ind. Six Admiral blackberry plants.

Mr. Riehl, Alton, Ill. Eight varieties seedling strawberries.

United States Department of Agriculture, Washington, D. C. Numerous plants, seeds, etc., for trial, sent from different Divisions. Also numerous publications.

UNITED STATES PERIODICALS.

The publishers of the following periodicals have generously sent them free of cost to the Station during the year. These are leading journals and are used frequently by both the Station employes and University students.

American Agriculturist.....	New York, N. Y.
Agricultural Epitomist.....	Indianapolis, Ind.
American Creamery.....	Chicago, Ill.
American Gardening.....	New York, N. Y.
American Grange Bulletin.....	Cincinnati, Ohio.
American Horticulturist.....	Wichita, Kansas.
American Sheep Breeder and Wool Grower.....	Chicago, Ill.
American Swineherd.....	Chicago, Ill.
Baltimore Sun (weekly).....	Baltimore, Md.
Beet Sugar Gazette.....	Chicago, Ill.
Breeder's Gazette.....	Chicago, Ill.
California Cultivator.....	Los Angeles, Cal.
Colman's Rural World.....	St. Louis, Mo.
Creamery Gazette.....	Des Moines, Iowa.
Creamery Journal.....	Waterloo, Iowa.
Dairy and Creamery.....	Chicago, Ill.
Dakota Field and Farm.....	Sioux Falls, S. D.
Drainage Journal.....	Indianapolis, Ind.
Elgin Dairy Report.....	Elgin, Ill.
Experiment Station Record.....	Washington, D. C.

Farm and Dairy.....	Ames, Iowa.
Farm and Fireside.....	Springfield, Ohio.
Farm and Home.....	Chicago, Ill.
Farm, Field and Fireside.....	Chicago, Ill.
Farm Journal.....	Philadelphia, Pa.
Farm Poultry.....	Boston, Mass.
Farmers' Call.....	Quincy, Ill.
Farmers' Guide and Home Companion.....	Huntington, Ind.
Farmers' Home.....	Dayton, Ohio.
Farmers' Magazine.....	Springfield, Ill.
Farmers' Review.....	Chicago, Ill.
Farmers' Tribune.....	Des Moines, Iowa.
Farmers' Voice.....	Chicago, Ill.
Farm, Furnace and Factory.....	Roanoke, Va.
Field and Farm.....	Denver, Colo.
Gazette (weekly).....	Cincinnati, Ohio.
Grange Visitor.....	Lansing, Mich.
Home and Farm.....	Louisville, Ky.
Hospodarske Listy.....	Chicago, Ill.
Indiana Farmer.....	Indianapolis, Ind.
Iowa Homestead.....	Des Moines, Iowa.
Jersey Hustler.....	Connersville, Ind.
Journal of Agriculture.....	St. Louis, Mo.
Kansas Farmer.....	Topeka, Kansas.
Live Stock Journal.....	Indianapolis, Ind.
Live Stock Report.....	Chicago, Ill.
Louisiana Planter.....	New Orleans, La.
Market Garden.....	Minneapolis, Minn.
Mirror and Farmer.....	Manchester, N. H.
Montana Fruit Grower.....	Missoula, Mont.
National Stockman and Farmer.....	Pittsburg, Pa.
National Farmer and Stockman.....	National Stock Yards, Ill.
National Fruit Grower.....	St. Joseph, Mo.
Nebraska Farmer.....	Lincoln, Neb.
New England Farmer.....	Boston, Mass.
New England Florist.....	Boston, Mass.
New York Produce Review.....	New York, N. Y.
North American Horticulturist.....	Monroe, Mich.
Ohio Farmer.....	Cleveland, Ohio.
Oregon Agriculturist.....	Portland, Ore.
Our Horticultural Visitor.....	Kinmundy, Ill., and Benton Harbor, Mich.
Pacific Coast Dairyman.....	Tacoma, Wash.
Pacific Rural Press.....	San Francisco, Cal.
Practical Dairyman.....	Indianapolis, Ind.
Practical Farmer.....	Philadelphia, Pa.

Prairie Farmer.....	Chicago, Ill.
Progressive South.....	Richmond, Va.
Public Ledger (daily).....	Philadelphia, Pa.
Reliable Poultry Journal.....	Quincy, Ill.
Rural Northwest.....	Portland, Ore.
Ruralist.....	Gluckheim, Md.
Southern Farm Magazine.....	Baltimore, Md.
Southern Planter.....	Richmond, Va.
Southern States.....	Baltimore, Md.
Southwest	Springfield, Mo.
St. Paul Dairy Report.....	St. Paul, Minn.
Success With Flowers.....	West Grove, Pa.
Sugar Beet.....	Philadelphia, Pa.
Swine Breeders' Journal.....	Indianapolis, Ind.
Tippecanoe Farmer.....	LaFayette, Ind.
Up-to-date Farming.....	Indianapolis, Ind.
Wallace's Stockman and Farmer.....	Des Moines, Iowa.
Western Creamery.....	San Francisco, Cal.
Western Fruit Grower.....	St. Joseph, Mo.
West Virginia Farm Review.....	Charleston, W. Va.
Wisconsin Agriculturist.....	Racine, Wis.

INDIANA PERIODICALS.

Advertiser	Medaryville.
Banner	Bluffton.
Columbia City Mail.....	Columbia City.
Democrat	Salem.
Home Journal	LaFayette.
Hoosier State.....	Newport.
LaFayette Commercial Gazette.....	LaFayette.
Lyons' Herald.....	Lyons.
Magnet	Angola.
Mennonitische Rundschau	Elkhart.
News	Monon.
Recorder	Rising Sun.
Register	Crown Point.
Silent Hoosier	Indianapolis.

FOREIGN.

Agricultural Gazette of New South Wales.....	Sidney, Australia.
Co-operative Farming.....	Sussex, N. B.
Deutsche Landwirthschaftliche Wochenschrift.....	Berlin, Germany.
Farmers' Advocate.....	London, Canada.

FarmingToronto, Canada.
 Mark Lane Express.....London, England.
 LaProduccion Argentina.....Buenos Ayres, Arg. Rep.

Besides the above, the following periodicals are subscribed for by the Station and are on file for reference:

American Veterinary Review.....New York, N. Y.
 Berichte der Deutschen Botanischen Gesellschaft.....Berlin, Germany.
 Botanisches Centralblatt.....Cassel-Marburg, Germany.
 Botanische Zeitung.....Leipzig, Germany.
 Bulletin de la Societe Chimique de Paris.....Paris, France.
 Centralblatt fur Bakteriologie.....Jena, Germany.
 Entomologist, TheLondon, England.
 Gardeners' Chronicle, The.....London, England.
 Journal fur Landwirthschaft.....Berlin, Germany.
 Journal of Comparative Medicine.....Philadelphia, Pa.
 Journal of the Royal Agricultural Society of England..London, England.
 Journal of the Chemical Society.....London, England.
 Live Stock Journal, The.....London, England.
 Veterinary Journal, The.....London, England.
 Veterinarian, The.....London, England.
 Zeitschrift fur Analytische Chemie.....Wiesbaden, Germany.

TREASURER'S REPORT EXPERIMENT STATION.

As Treasurer of the Purdue University, I hereby submit my report of all moneys received during the year, ending June 30, 1899, on account of Experiment Station funds:

From United States Government.....	\$15,000.00
From farm receipts.....	1,587.42

Total	\$16,587.42
-------------	-------------

JAMES FOWLER,
Treasurer Purdue University.

FINANCIAL STATEMENT.

The Agricultural Experiment Station of Indiana, in account with the United States, for the year ending June 30, 1899.

DEBIT.

Received of the Treasurer of the United States, receipts as shown by the Treasurer's report.....\$15,000 00

CREDIT.

Salaries	\$8,210 54
Labor	3,171 12
Publications	702 49
Postage and stationery.....	67 11
Freight and express.....	78 51
Heat, light and water.....	331 93
Chemical supplies.....	143 50
Seeds, plants and sundry supplies.....	530 89
Fertilizers	9 93
Feeding stuffs.....	255 90
Library	116 71
Tools, implements and machinery.....	443 85
Furniture and fixtures.....	9 30
Scientific apparatus.....	
Live stock.....	363 00
Traveling expenses.....	42 05
Contigent expenses.....	16 21
Building and repairs.....	506 96

Total\$15,000 00 \$15,000 00

I hereby certify that the above is a correct statement of expenditures in Station Fund for the year ending June 30, 1899.

E. A. ELLSWORTH,
Secretary Board of Trustees.

IMPROVEMENT FUND, EXPERIMENT FARM FOR YEAR ENDING
JUNE 30, 1899.

DEBIT.

Balance, June 30, 1889.....	\$973 91
Receipts from farm for year ending June 30, 1899.....	1,587 42

CREDIT.

By salaries.....	\$855 26	
By labor.....	648 81	
By publications.....	150 36	
By postage and stationery.....	8 77	
By freight and express.....	9 00	
By heat, light and water.....	105 19	
By chemical supplies.....	2 80	
By seeds, plants and sundry supplies.....	126 55	
By feeding stuffs.....	72 75	
By tools, implements and machinery.....	44 25	
By furniture and fixtures.....	6 00	
By scientific apparatus.....	5 00	
By live stock.....	21 02	
By traveling expenses.....	2 16	
By contingent expenses.....	82 83	
By building and repairs.....	6 00	
By balance.....	414 58	
		\$2,561 33 \$2,561 33

I hereby certify that the above is a correct statement of expenditures
from Improvement Fund for year ending June 30, 1899.

E. A. ELLSWORTH,
Secretary Board of Trustees.

THE SUGAR BEET IN INDIANA.

H. A. HUSTON AND A. H. BRYAN.

At the beginning of the season much popular interest was manifested in the sugar beet question. Sugar beet clubs or associations were organized in the Kankakee Valley, Allen County, Clinton County, Indianapolis and surrounding counties, and Morgan County. These organizations were of material aid in inducing farmers to undertake experimental work and in urging them to continue it in such a manner that the results might be of value. Some of these organizations also secured seed and distributed it free of charge. Some agricultural societies and business firms offered special prizes for the best beets produced in their localities.

The Experiment Station secured an abundance of seed from the United States Department of Agriculture, and furnished it free of charge to all who asked for it. The work of distribution was much facilitated by the use of the mailing frank, secured through the courtesy of the United States Department of Agriculture.

The Station offered to make free analysis of all sugar beets raised in the State, and to provide franks for sending samples free of transportation charges.

Every effort was made to co-operate with the various organizations interested and to secure as full reports of the work as possible.

The total number of persons receiving seed from the Station and from the organizations mentioned above was 1,169. Of these the Station supplied 736.

Full directions were furnished for the work, and experimenters were especially urged to follow these directions as closely as practicable, in order to avoid producing bad beets by improper methods of cultivation.

The seed distributed by the Station was thoroughly tested before it was sent out, and found to be of very satisfactory quality. We also tested a lot of 800 pounds of seed, sent us by one of the organizations. This seed was found to be of very inferior quality, probably due to damage in shipping and storing. This seed was therefore destroyed, and only that

of the best quality sent out. In a few instances reports were received that this seed did not come up. But the trouble seems to have arisen from too deep planting or from heavy rains packing a rather heavy soil. The size of the plats ranged from one-eighth to one acre.

The methods of raising beets and other matters of interest relating to the subject were discussed in Bulletin No. 68. The Station can supply copies of this bulletin to those who request it, and for this reason the present bulletin is confined to a statement of the results obtained this season, and a discussion of the climatic conditions affecting these results.

CLIMATIC CONDITIONS IN 1898.

A summary of the average temperature and rainfall is given in Table I. The month of March was unusually warm, and the rainfall is the

TABLE I.
AVERAGE TEMPERATURE FOR 15 YEARS. DEGREES FAHRENHEIT.

COUNTIES.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Northern	23.8	27.0	35.7	50.1	60.2	70.8	74.1	71.0	65.0	51.1	38.5	28.9
Central	26.8	30.3	38.5	52.1	61.8	72.0	74.9	71.7	66.3	52.4	40.3	33.1
Southern.	30.7	34.0	41.9	55.5	64.0	73.7	76.0	74.5	68.1	54.8	43.4	35.8

AVERAGE TEMPERATURE—1898.

Northern	29.8	29.0	42.9	47.4	60.6	71.5	75.0	72.3	67.2	51.8	36.2	...
Central	32.8	32.0	45.6	49.3	62.6	72.6	76.0	73.7	69.5	54.1	38.7	...
Southern.	37.6	36.4	49.0	51.7	66.2	75.5	78.1	76.6	72.1	55.8	41.5	...

AVERAGE PRECIPITATION FOR 15 YEARS. INCHES.

Northern	2.54	2.52	2.71	2.99	4.51	3.82	3.07	2.84	3.10	2.07	3.45	2.52
Central	3.14	3.01	3.38	3.44	3.98	3.91	3.14	3.25	3.28	1.98	3.93	2.73
Southern.	3.89	3.92	4.31	3.91	3.98	4.16	3.48	3.45	3.32	1.95	4.26	3.08

AVERAGE PRECIPITATION—1898.

Northern	3.18	1.81	5.29	1.74	5.10	3.97	2.99	3.20	2.96	5.00	3.24	...
Central	5.18	1.93	9.66	2.03	3.99	3.78	3.54	3.46	4.22	4.39	2.86	...
Southern.	7.46	1.86	9.37	2.41	4.38	3.67	3.52	3.42	4.99	4.29	2.51	...

greatest ever recorded for that month in any year. This was followed by a cold April, with rainfall below the average, but so distributed that there was difficulty in working the land. May was slightly warmer than the average, and the rainfall was so distributed in northern counties that at many points planting was delayed until the last week in May or the first week in June. The months of June, July and August show temperatures above the average, and a well distributed rainfall of about average amount.

During the summer months, the conditions favored the continuous and rapid development of the beets. The months of September and October, during which the beets should ripen, were characterized by high temperature, cloudy weather, and a high rainfall. In October the rainfall was more than double the average amount. The transition from the unusually warm and moist weather of October to the cold weather of November, was too sudden to permit the beet to ripen in many places. The result was that in many places the November freeze came on while the beets were still growing, and the transition from warm, moist, growing weather to severe cold weather, was so abrupt as to give no chance for the beets to ripen and develop a normal sugar content.

Such a combination of climatic conditions is very unusual in this State. Generally, when the October temperature is above the average, the rainfall is below the average, and the best growth is checked, and ripening begins.

RESULTS ON ANALYSES MADE IN 1898.

The first week in September several fields were selected in different parts of the State, and analyses of samples from these fields were made at frequent intervals, for the purpose of studying the question of time and ripening. In the past, samples have been sent to the Station any time after the first of September. It frequently happened that all the beets in an experimental plat were harvested at the time the sample was sent. In case the beets were not ripe, the results would seem to show that satisfactory beets could not be produced, while the real fact was that the beets were harvested too early. This season growers were asked to delay harvest until the preliminary tests were made. This precaution proved a very desirable one, for the season was so wet that ripening was delayed. In very many cases, growers were told that the results of the analysis of first samples indicated unripe beets, and were asked to send a second sample at a later date. In most cases these later samples were much better than the first. In some cases, especially in the central part of the State, these latter tests showed that the beets had taken on a second growth, due to wet, warm weather.

Beets containing 12 per cent. of sugar and a purity of 80, are con-

sidered satisfactory by factories. In some cases beets as low as 10 per cent. sugar are accepted, but usually at a reduced price.

The results in Table II show that in spite of a most unfavorable season beets of satisfactory quality have been raised in many parts of the State. In forming conclusions from results of analyses, it should be kept in mind that the grade of the seed used is of very great importance in determining the quality of beets produced. The beet seed sent out by the Station was of satisfactory kind. But the table contains analyses of beets raised from seed distributed by associations and clubs, and this seed may have been in part of lower grade. Considering the very unusual demand for seed last spring, it is quite likely that some failed to secure seed of the highest grade.

The hard freeze in the second week in November was fully one month earlier than usual in this State, and following a long period of wet weather, it arrested the development of the beet before the ripening could be completed.

The general conditions of the season have favored a high yield, with low sugar content.

With our common field crops, a high yield is associated with good quality and a low yield with inferior quality, but with the beet crop the reverse is the case; a lower quality is usually compensated for by a higher yield and a low yield almost always gives beets of a very high quality.

The yields in the table are calculated from data furnished by the growers. The method of obtaining the yield in most cases must be considered as only a rough approximation, and some of the reported yields are far in excess of what is to be expected in commercial beet raising.

The method of properly raising sugar beets calls for much deeper plowing and closer rows than our common farm crops. These conditions call for extra work on the part of the farmer, and often puts him to considerable trouble in raising experimental plats, yet these conditions were met this season by a much larger proportion of experimenters than in any previous season.

Under the heading of "Kind of Cultivation" in the table,

a means that plowing was not less than 10 inches deep, and that the rows were not over 26 inches apart.

b means that the grower failed in one of these particulars.

c means that the grower failed in both of these particulars.

d means that no report on these points was received.

The report forms asked the grower whether from his experience during the present season, he believed that he could profitably raise beets if he received \$4 per ton for his product.

To this question forty-one growers gave no reply, eighty-four answered "yes," forty-nine answered "no," and five were doubtful.

It must be kept in mind that these answers refer only to the work

of the present year, and in many cases the work was new and doubtless not conducted in the most economical way.

It will be noted that no averages are made in the table. We believe that in the discussion of the results of such work, the individual results should be considered, and that averages formed by combining results from good and bad seed, different soils, and all sorts of cultivation, are not calculated to give a fair estimate of the possibilities of a county or State.

The results of this year's work must be viewed in the light of experiments conducted under weather conditions calculated to give beets of unusual low quality. The quality of the beets must be considered to be as bad as any that are likely to ever be produced in the State. Notwithstanding this, we report that beets of satisfactory quality have been produced in many parts of this State. In portions of central Indiana where the results are unsatisfactory this year, beets of satisfactory quality were produced last year.

STATE AID FOR THE BEET INDUSTRY.

In a number of States, laws have already been passed giving encouragement to the industry.

These laws generally provide for a State bounty for a limited number of years, and also provide that the beet grower shall receive a specified share of this aid or a fixed price per ton for his beets.

The clubs and associations in this State will probably ask the coming legislature for some legislation of this character. These laws have doubtless been of material importance both in inducing capitalists to locate factories and growers to engage in raising beets. Wherever good judgment has been shown in the building of factories, the results have been reported to be profitable, both to the factory and the beet raisers.

The Experiment Station wishes to place its work of the past eleven years at the disposal of all parties interested in the development of the beet industry in Indiana.

NEW CONDITIONS AFFECTING THE INDUSTRY.

The results of the war with Spain, involving the control by the United States of tropical islands producing cane sugar, have given rise to much discussion in regard to how the American beet industry will be affected. It is of course too early to know the exact relation that these islands will bear to the United States. A large number of articles have appeared on the subject, expressing very diverse views of the effects on the American sugar industry. Some of these are mere statements of opinion, and others discuss the matter from a statistical standpoint. Dr. W. H. Wiley, Chief Chemist of the United States Department of Agriculture, discusses the

matter from a statistical standpoint, and summarizes the results of his study in a paper prepared for the Louisiana Sugar Planters' Association* as follows:

1. "That the annexation of the Hawaiian Islands, Porto Rico, and the Philippines will have no directly damaging effect on the cane and beet sugar industry of the United States."

2. "That an American protectorate over Cuba, not involving the free admission of Cuban sugar, will result in the practical cessation of beet sugar imports from Europe, but will not adversely affect the sugar industry in this country."

3. "That the possibility of an American protectorate in Cuba, resulting eventually in Cuban annexation, or a custom union, will deter capital from investment in sugar factories in this country, and thus indirectly, the results of the Spanish war will become a check to the expansion of the sugar industry in the United States. For this reason it is not to be expected that there will be any marked increase in sugar production in this country for several years to come.

4. "That the final annexation of Cuba, or the foundation of a custom union with her, would be a severe, if not fatal blow to the existing sugar industry in the United States, and it is doubtful if it could continue to survive. The rapid increase in population during the next hundred years, however, might secure the revival of the industry within the present limits of the United States, though this is a consideration too remote for practical application at the present time."

*In the Louisiana Planter and Sugar Manufacturer for December 10, 1898.

TABLE II. ANALYSIS OF INDIANA SUGAR BEETS.

NAME.	Post Office.	Variety Beet.	Average Weights Ounces.	Per Cent. Sugar in Juice	Per Cent. Sugar in Beet.	Purity.	Class of Soil.	Tons per Acre.	Date of Planting.	Date of Harvest.	Cultivation.
Allen Co.											
Edward Taylor.	Aboite.	Kleinwanslebener.	16.4	13	12.3	86.6	Black sand.	30	Apr. 28	Nov. 7	c
Albert Stearns.	Woodburn.	Klein.	21.2	10.1	9.6	77.6	Black loam.		May 10	Oct. 1	c
Dan Goeglin.	Goeglin.	Vilmorin.	20.5	12.2	11.6	87.1	Black sand.		Apr. 21	Nov. 3	c
John Rapp.	Arcola.	Klein.	14.8	10.1	9.6	76.5	Clay.		May 10	Oct. 19	c
John Rapp.	"	Vilmorin.	31.5	13	12.3	81.3	Black loam.		" 10	" 19	c
Jacob Shaffer.	"	"	16.8	11.6	11	81.1	Black sandy loam.	23.3	" 14	" 19	c
H. W. Charles.	Fort Wayne.	"	23.9	11	10.4	81.2	Sandy.		" 18	" 24	c
Dr. G. B. M. Brown.	"	"	15.7	10.4	9.9	80	Sand.		May 22	" 28	c
William F. Hagan.	Arcola.	Klein.	22.5	12.1	11.5	84	"		May 22	Nov. 31	b
John Harper.	New Haven.	"	52.9	12.3	12.1	82	"		May 7	Nov. 3	b
Samuel A. Brown.	Heller's Corner.	Klein.	15.4	14.2	13.5	87.6	Black loam.	16.3	Apr. 22	" 3	b
Wm. H. Thompson.	Edgerton.	"	17.5	9.3	8.7	73.6	"		Apr. 25	" 4	b
C. Ahlschwede.	Goest.	Vilmorin.	21.4	12.2	11.6	83.4	Yellow loam.	51.3	May 30	" 4	b
F. C. W. Kiehn.	Fort Wayne.	Klein.	26	12.5	12.1	85.9	Black sandy loam.	52.2	Apr. 30	" 4	b
F. C. W. Kiehn.	"	Vilmorin.	19.9	9.2	8.7	74.2	"		"	"	c
Patrick Ryan.	Gar Creek.	Klein.	18.5	14	13.3	88	Clay.		May 7	" 7	c
William Shaefer.	Goeglin.	"	12.6	14.4	13.7	85.7	Black sandy.		June 12	" 7	c
Henry Prosser.	Fort Wayne.	"	19.6	13	12.3	86	Sandy clay.	35.2	May 15	" 8	c
G. A. Weikel.	"	"	13.6	14.3	13.6	78	Black loam.	19	May 20	" 8	c
Herrman L. Frier.	"	Vilmorin.	17.5	12.3	12.3	85.3	Clay.		" 20	" 9	c
A. P. Henry.	Sheldon.	Klein.	42.4	12.4	11.8	84.3	Part muck.		"	" 9	c
H. F. Schmelker & Co.	New Haven.	"	18.5	12.3	11.7	83.7	"		"	" 9	c
F. Roland.	Huntertown.	Klein.	16.7	13.5	12.3	83.9	Black sandy.		Apr. 23	" 10	c
Fred Roland.	Fort Wayne.	Vilmorin.	15.7	12.6	12	86.1	"		"	" 10	c
Wm. H. Hartman.	"	Klein.	26.2	13.3	12.7	91	Black		"	" 10	c
Wm. H. Hartman.	"	Vilmorin.	23.4	13.5	12.8	83.2	"		"	" 10	c
H. P. Wiese.	"	"	8.7	11.3	10.7	79.1	Black sand.	14.4	May 10	" 11	c
H. P. Wiese.	Chamberlain.	Klein.	17.5	13.4	12.7	80.2	Sandy loam.	21	Apr. 6	" 11	c
Samuel Schwartz.	Fort Wayne.	"	40.3	8.3	7.9	71.5	Black clay.		May 10	" 14	c
W. A. Fairchild.	Waller.	"	17.5	13.3	12.3	80	Clay.		Apr. 14	Nov. 14	c
Chas. F. Lind.	Fort Wayne.	"	17.5	13.3	12.3	80	"		"	"	c
George H. Darby.	"	"	17.5	13.3	12.3	80	"		"	"	c
Chas. Hockemeyer.	"	"	17.5	13.3	12.3	80	"		"	"	c

John Sentehi.	Harles.	Klein	16.8	12.8	11.7	79	Black loam	..	May 25	Nov. 14	b
Louis Beroot.	Fort Wayne	"	19.2	13.	12.3	85.5	Blue clay	..	June 1	" 14	c
Fred Hockemeyer	"	"	21	11.6	11	79	Clay	..	Apr. 27	" 14	b
Fred Hockemeyer	"	Vilmorin	18.9	14.2	13.5	86.6	Black clay.	..	Apr. 27	" 14	b
Adolph Stotto	"	"	19.7	14.1	13.4	80.5	Sandy	..	May 15	" 14	c
Calvin Bowman	Aboite.	Vilmorin	14.3	12.1	11.5	82.3	Sandy loam	..	May 15	" 14	a
Chas. F. H. Dreyer	Fort Wayne	Klein	34	13	12.3	81.2	Black	..	Apr. 10	" 14	b
W. F. De Vilbiss	"	Vilmorin	9.6	14.1	13.4	92.6	Clay loam	..	Apr. 15	" 16	a
W. F. De Vilbiss	"	"	9.1	14.4	13.7	93	"	..	" 15	" 16	a
W. F. De Vilbiss	"	"	5.5	15.3	14.5	91.7	"	..	" 15	" 16	a
Samuel E. Peters.	Chamberlain	Klein	18.9	11.1	10.5	85.4	Black loam	..	" 20	" 16	b
Oren R. Yerks	"	"	18.9	12.6	11.	93.4	Sandy	..	" 25	" 16	a
F. H. Peters	Fort Wayne	"	18.5	11.8	11.2	84.3	Clay and sand	..	May 25	" 19	a
Paul Zink	Gar Creek.	"	37.9	11.6	12	83.5	Black	..	May 10	" 19	b
J. W. Fonner.	Poe	"	11.2	11.8	11.2	81.3	Black loam	..	" 10	" 21	"
Noah Knepper	Fort Wayne	Vil. and Klein	11.9	12.9	12.2	82.6	"	..	May 10	" 21	b
Marcellus Thurber.	"	Klein	17.1	12.5	11.9	80.6	Clay	..	" 15	" 21	c
William Bremmer	New Haven	"	14	16	15.5	90.4	Dark sandy loam	..	" 6	" 23	a
George J. Newdesley.	Zulu.	"	26.2	14.5	13.7	89.8	"	..	" 6	" 23	b
O. Knoblauch	Woodburn.	"	29.7	14.2	13.5	82.5	Black loam	..	May 15	" 28	a
Blackford Co.								32			
S. W. Brindle.	Pennville	Vilmorin	25.5	9.3	8.8	75.6	Mucky.	..	June 1	Nov. 1	b
Boone Co.											
J. N. Shively	Lebanon.	Vilmorin	8	14	13.3	87.5	Sandy loam	..	May 10	Nov. 3	a
Henry C. Steede	Terhune.	"	13.3	13.2	12.5	85.1	Black loam	..	" 12	" 14	c
Carroll Co.											
N. J. Smith.	Cutler	Vilmorin	7.5	13.3	12.6	86.3	Sandy clay loam	..	June 4	Nov. 9	a
H. Brooke	"	"	7	10.8	10.2	80	Black loam	..	" 16	Oct. 19	a
Cass Co.											
J. H. Keyes	Logansport	Vilmorin	9.6	9.6	9.1	74.4	Clay	..	May 15	Oct. 4	b
Herrman Adamsky	"	"	10.5	10.8	10.2	72	Black	..	" 2	Oct. 6	a
John N. Cast.	Royal Center	Klein	12.9	12.5	11.9	87.4	Sandy loam	..	Apr. 21	" 12	a
A. B. Stanton	Logansport	"	17.5	14.3	13.6	90	Sandy clay	..	May 18	Nov. 1	a
J. R. Gotshall	"	"	15.7	11.6	11	85.3	Black clay.	..	" 1	" 16	a
John Burkhardt.	"	Vilmorin	14.7	13	12.3	84.4	"	..	" 27	" 9	a
William Pangburn.	Young America.	Klein	9.4	14.7	13.9	83.4	Black sand	..	" 30	" 9	a

TABLE II.—CONTINUED.

NAME.	Post Office.	Variety Beet.	Average Weight, Ounces.	Per Cent. Sugar in Juice.	Per Cent. Sugar in Beet.	Purity.	Class of Soil.	Tons per Acre.	Date of Planting.	Date of Harvest.	Cultivation.
Clinton Co.											
A. B. Ghore	Frankfort	Vilmorin	13.6	12	11.4	81.6	Clay	10	May 20	Nov. 8	b
C. E. Wilson	Rossville	Klein	15	12.7	12	80	Sandy loam . . . .	. . . .	" 1	Nov. 14	a
Marion Anderson . .	Manson	Vilmorin	18.8	11.5	10.9	87.7	Red sandy loam . .	. . . .	" 4	Oct. 27	a
Jacob Leibersperger .	Frankfort	"	12.6	10	9.5	82	Clay . . . .	. . . .	" 10	" 4	c
Eli Marvin	"	Klein	17.5	13.3	12.6	86	Sandy loam . . . .	. . . .	" 3	" 31	a
Henry Amey	"	"	19	10.2	9.7	77.2	Prairie	19.4	Apr. 20	" 4	a
Wm. Stevenson	Rossville	Vilmorin	12.9	10.3	9.8	80	Black sandy loam . .	13.7	May 12	" 6	c
J. M. Snodgrass . . .	Scircleville	"	18.2	12.9	12.3	96.8	Clay loam	18.2	Apr. 28	" 11	b
J. M. Snodgrass . . .	"	"	18.2	15.5	14.7	90.1	Black loam	21.6	Apr. 28	" 31	a
H. M. Baum	Frankfort	"	19.3	9.8	9.3	75.3	Sandy loam . . . .	. . . .	May 27	" 13	c
C. M. Petty	"	"	9.8	8.9	8.4	67	Black loam	21.9	May 3	" 15	b
W. H. Armentrout . .	"	"	13.6	10.6	10	77.4	Sandy loam	18.9	Apr. 28	Nov. 14	c
A. N. Daywitt	"	"	14.8	13.3	12.6	80	Sugar tree clay . . .	19.8	May 7	Nov. 14	b
Llewellyn Clark . . .	Moran	"	18.9	12.8	12.1	84.7	Black walnut	11.1	May 26	Oct. 25	c
D. A. Thompson . . .	Frankfort	"	19.6	12.9	12.2	81.1	Sandy loam . . . .	. . . .	" 5	Oct. 27	b
Frank J. Hawley . . .	"	"	15	11	10.4	84	Black prairie	11.8	Apr. 22	" 27	a
Urias King	"	"	22.7	8	7.6	63.5	" . . . .	. . . .	" 10	" 29	d
W. W. Richey	"	Klein	11.5	15.3	14.5	86.4	Black . . . .	. . . .	May 10	Nov. 5	a
J. M. Que	Michigantown	Vilmorin	12.6	13.4	12.7	86	Black . . . .	. . . .	" 13	" 11	a
M. Cochran	Frankfort	"	28	10.6	10	80	" . . . .	. . . .	" 10	" 12	d
J. P. Bond	Michigantown	Vilmorin	12.2	10.5	10	79	Black loam . . . .	. . . .	May 10	" 14	b
J. M. Turner	Kirklin	Klein	26	11.6	11	79	Yellow clay . . . .	. . . .	" 81	" 14	a
L. N. Salisbury	Frankfort	Vilmorin	10.8	10.6	10	73.6	Black loam	21.8	" . .	" 19	a
Orawford Co.											
Arville E. Taylor . . .	Marengo	Vilmorin	14.1	9.8	9.3	83	Clay . . . .	. . . .	Apr. 28	Oct. 3	a
Davless Co.											
Abner D. Colbert . . .	Washington	Vilmorin	10.5	19.8	10.2	82.3	Sandy	12.3	May 10	Oct. 24	a
John Ruggles	"	Klein	14.7	11	10.4	77.5	"	26.1	" 10	" 29	a
Zack Taylor	"	"	13.1	13.6	12.3	85.5	" . . . .	. . . .	" 10	" 31	c

Dearborn Co.		Harrison, Ohio.		Vilmorin	3.8	11.5	10.9	85.1	Sandy	May 16	Oct. 19	a
Geo. C. Longenecker.												
Delaware Co.												
Silas Ferguson		Gaston	Klein		12.6	12.5	11.9	83.3	Red clay	May 9	Oct. 6	a
Andrew Jackson		Anthony	Vilmorin		8.7	10.7	10.1	75	Black loam	May 10	Nov. 12	c
Dekalb Co.												
E. F. Carnahan		Auburn	Vilmorin		18.2	14	13.3	87	Black loam	May 9	Nov. 5	b
W. E. Ruple		"	Klein		15.7	14.2	13.5	85.5	Sandy loam	June 15	" 5	b
Chas. E. Miser		Waterloo	"		21	13	12.3	87.8	"	May 6	" 7	a
Ezra H. Horn		Spencerville	Vilmorin		11	16.1	15.3	83.4	Clay loam	April 30	" 14	a
Elkhart Co.												
E. F. Manning		Elkhart	Klein		8	14	13.3	70.2	Sandy loam	May 9	Nov. 14	a
Franklin Co.												
John S. Martin		Brookville	Klein		18.2	8.4	8	77	Sandy	May 1	Oct. 29	a
John L. Cowen		Bath	"		13.3	11.2	10.6	76.2	Light clay loam	" 9	Nov. 15	a
Fulton Co.												
E. Millison		Kewanna	Vilmorin		9.6	12.9	12.2	84.9	Sandy loam	June 3	Nov. 3	b
Otto Caple		Bruce Lake	Klein		9.6	14	13.3	88	Sandy clay loam	" 3	" 3	b
Grant Co.												
T. W. Williams		Upland	Klein		13.6	13.3	12.6	86	Mucky loam	May 20	Oct. 31	a
Greene Co.												
O. P. Cushman		Mineral	Klein		4	10.1	9.6	81.4	Sandy loam	May 20	Oct. 5	a
Hamilton Co.												
John Wilson		Sheridan	Klein		18.9	13.3	12.6	87.5	Black	May 18	Nov. 5	a
Jesse Cox		Westfield	"		30.4	11.2	10.6	84.2	Sandy loam	April 20	" 10	c
D. Linton		Sheridan	"		7.7	14.4	13.7	91.8	Black loam	May 9	" 11	a
Samuel W. Cook		"	Klein		14.8	11.8	11.2	79	Clay	" 11	" 11	a
Samuel Barker		"	"		19.9	10.4	9.9	73.7	Sandy loam	May 17	" 11	a
A. C. Scott		"	"		18	11.7	11.1	79	Clay	" 3	" 14	c
Mary J. Barker		"	Klein		26.2	13.3	12.6	88.6	Sandy loam	" 15	" 15	a
L. G. Metaker		Noblesville	Vilmorin		14.3	12.9	12.2	90.2	Clay	" 4	" 15	b
O. C. Lindley		Sheridan	"		16.1	12	11.4	85.7	Black clay loam	" 31	" 16	a
Newton Tetor		Noblesville	Klein		17.5	11.4	10.8	79	Clay	" 10	" 18	b
S. M. Cox		Westfield	Vilmorin		16.1	8.5	8	72	Sandy bottom	April 15	" 19	c

TABLE II.—CONTINUED.

NAME.	Post Office.	Variety Beet.	Average Weight, Ounces.	Per Cent. Sugar in Juice.	Per Cent. Sugar in Beet.	Purity.	Class of Soil.	Tons per Acre.	Date of Planting.	Date of Harvest.	Cultivation.
Hancock Co.											
Hiram Dunham . . .	McCordsville. . .	Klein.	15.7	11.8	11.2	85	Black sandy	23.7	April 20	Nov. 9	b
Hendricks Co.											
Gueben Seearce . . .	Danville	Klein.	11.2	11	10.4	85.2	Black loam		May 13	Oct. 10	b
James Kersey . . .	Amo	Vilmorin.	20.3	9.5	9	76.8	Sugar tree	15	April 8	Nov. 3	a
J. M. T. Wellborn . .	Bridgeport	Klein.	12.7	12.3	11.7	76.8	Sugar tree	17.4	June 3	Nov. 18	a
Fred R. Soper . . .	Danville	Vilmorin.	18	11	10.4	78.6	Yellow clay	19.8	May 12	Oct. 27	b
John H. Hulfaker . .	Pittsboro	Klein.	14.3	13	12.3	89	Black loam	21.1	" 14	Nov. 3	a
Milo Johnson . . .	Brownsburg	Vilmorin.	21	10.4	9.9	73.2	Black sandy	22.4	" 2	" 4	b
John Hicks	Plainfield	"	15.4	10.5	10	80.1	Black soil		" 11	" 30	a
B. S. Hadley	"	"	8.4	9.5	9	72.5	Sandy creek bottom . .	11	" 11	" 30	a
Henry Co.											
John Parker	Lewisville	Klein.	15.7	13.2	12.5	91	Black sandy loam . . .		May 11	Oct. 29	a
John Parker	"	"	12.2	13.2	12.5	88	Clay		" 12	" 29	a
Howard Co.											
S. O. Murphy	Plevna	Klein.	8	14.4	13.7	79.1	Black loam	22.2	May 8	Oct. 8	a
Vite Golladay	Kokomo	"	37.8	10.7	10.1	80.4	Sandy loam	23.9	April 22	Nov. 16	b
O. L. Evans	Russiaville.	Vilmorin.	15.7	14	13.8	78.7	Sandy loam	33.3	May 27	" 26	a
C. B. F. Clark	Kokomo	Klein.	16.5	12.5	11.9	82.7	Sandy loam	17.4	" 27	" 17	a
Jackson Co.											
Fred H. Spay	Elwink	Klein.	15.4	10.7	10.1	76	Sandy bottom		May 17	Nov. 12	b
Ruell Brown	Kurts	Vilmorin.	7	12.3	11.4	84.3	Clay loam	9.8	" 20	Nov. 19	"
Henry Nayrocker . .	Heymour	"	21	8.3	8.3	80	Black sandy		" 15	Oct. 26	"
Fred C. Rust	"	Klein.	15.5	10.5	10	80.1	Very sandy loam . . .		April 20	Oct. 28	b

Jasper Co.		Virgie	Klein	6.6	14	13.3	85.3	Sandy	May 19	Oct. 13	b
Lewis S. Alter		Remington	"	6.1	10	9.5	80	Black clay loam	April 21	" 26	a
Jay Co.											
W. A. DeWees		Balbec	Vilmorin	17.1	12.3	11.7	80	Clay loam	May 13	Nov. 12	b
Albert M. Lutes		Greene	Klein	9.1	17.2	16.3	86.8	Sandy clay	" 4	" 21	b
Jefferson Co.											
Fred Reul		Beecamp	Klein	10.5	11.3	10.7	81.8	Gray	May 5	Nov. 21	c
Johnson Co.											
F. A. Stone		Stone's Crossing	Vilmorin	7.7	10.9	10.3	81.1	Clay	May 3	Nov. 5	b
Mark L. Bass		Greenwood	Vilmorin	4.9	10.2	9.7	82.2	Sandy loam	June 3	Oct. 31	c
Chas. G. Surface		Stone's Crossing.	Vilmorin	9.4	10	9.5	75.7	Clay	" 5	Nov. 11	b
John R. Surface		Stone's Crossing.	Vilmorin	16.1	9.9	9.4	84.6	Sandy	May 15	" 16	a
John A. Polk		Greenwood	"	18.5	9.3	8.8	75.6	Mulatto loam	June 1	" 19	a
Chas. E. Gray		Needham	"	23.8	13	12.3	81.7	Red clay loam	May 18	Dec. 9	a
Knox Co.											
John A. Hunet.		Vincennes	"	18.7	6	5.6	60.6	Black sand	May 20	Nov. 19	b
Kosciusko Co.											
J. H. Hepler		Atwood	Klein	16.4	12	11.4	86.3	Light sandy loam	May 10	Oct. 15	a
Lagrange Co.											
William C. Jackson		Lagrange	Klein	11.1	14.5	13.7	89.9	Black sand	May 18	Oct. 22	c
W. H. Jackson		Valentine	Klein	9.8	17	16.1	90.5	Sandy loam	" 18	Nov. 14	c
Eugene Dickenson		Wolcottville	Klein	21.7	13	12.3	83.4	Sandy gravel	April 28	" 4	a
Lake Co.											
M. L. Bickford		Wichert, Ill.	Vilmorin	5.9	14.6	13.8	90	Sandy loam	May 7	Oct. 25	a
O. Dunwiddie		Orchard Grove	Vilmorin	6.3	11.3	10.7	82	Dark sandy	" 9	Nov. 9	a
Laporte Co.											
John W. Denham		Stillwell	"	11.9	13.5	12.8	82.9	Black sand	May 1	Nov. 12	c
N. F. Jenks		Waterford	Klein	16.4	16.6	15.8	90.2	Sandy	" 28	" 4	a
H. N. Fox		Union Mills	Klein	16.4	12.3	11.7	81.4	Sandy loam	" 15	Oct. 19	c
Dr. Horace Wardner		Laporte	Vilmorin	23.6	13.2	12.5	84	Sandy clay loam	" 3	Nov. 18	b
John P. Oakes		Laporte	Klein	17.5	13.8	13.1	89.6	Clay and black	April 21	Oct. 31	b

TABLE II.—CONTINUED.

NAME.	Post Office.	Variety Beet.	Average Weight, Ounces.	Per Cent. Sugar in Juice.	Per Cent. Sugar in Beet.	Purity.	Class of Soil.	Tons per Acre.	Date of Planting.	Date of Harvest.	Cultivation.
Madison Co.											
Mrs. Andersen	Johnson's Cross- ing	Klein	6.1	12.4	11.8	83.2	Black loam . . . . .	. . .	May 20	Nov. 17	a
Marion Co.											
J. M. Johnson	Malott Park	Klein	8.2	11.1	10.5	88.8	Black loam . . . . .	. . .	May 17	Sept. 23	a
John G. Klein	Malott Park	Vilmorin	17.5	8.6	8.1	79	Clay . . . . .	. . .	Oct. 1	Oct. 1	a
J. M. Risley	Broad Ripple	Vilmorin	17.8	11.4	10.8	86	Black loam	22.2	April 28	Nov. 3	a
C. E. Thornton	Indianapolis	Klein	29.2	11.5	10.9	81.5	Black sandy loam	17.8	" 28	Nov. 4	b
George Hevy	Acton	Klein	14	9.8	9.3	70	Black loam . . . . .	. . .	" 20	Oct. 13	c
Samuel Clark	Broad Ripple	Klein	8.4	12.8	12.1	84	. . . . .	. . .	. . .	Oct. 21	d
R. M. Kline	Southport	Klein	17.8	7.8	7.4	66.1	. . . . .	. . .	. . .	" 28	d
E. G. Moore	Southport	Klein	17.5	11.5	10.9	86	Black sandy . . . . .	. . .	May 7	" 31	a
Frank Smith	Valley Mills	Klein	8.7	12.7	12	87	. . . . .	. . .	May 10	" 31	d
J. M. White	Irvington	Vilmorin	12.6	13	12.3	82.7	Clay and black	11.6	Nov. 7	Nov. 18	a
W. F. Christian	Indianapolis	Vilmorin	23.8	9.2	8.7	71.3	Clay	19	" 20	" 18	c
J. G. Kingsbury	Indianapolis	Klein	8.7	14.1	13.4	83.4	Rich bottom . . . . .	. . .	" 15	" 18	c
B. Dawson	Indianapolis	Klein	18.7	12.1	11.5	84	Clay loam . . . . .	. . .	" 20	" 22	a
J. J. Milheus	Valley Mills	Klein	11.9	12.4	11.8	83.6	Clay loam . . . . .	. . .	" 15	Dec. 14	a
Miami Co.											
S. A. Riggs	Converse	Vilmorin	12.6	12.5	11.9	86.2	Black	15.8	April 28	Nov. 7	b
Monroe Co.											
C. D. Faris	Bloomington	Vilmorin	12.4	10.5	10	84.7	Clay loam	14.6	April 22	Nov. 8	a
Morgan Co.											
Alexander Hardwick . .	Brooklyn	Vilmorin	15.7	10	9.5	88	Yellow clay loam . . . .	. . .	May 27	Nov. 21	b
Walter J. Quick	"	Klein	15.7	12.2	11.6	83.6	Clay . . . . .	. . .	June 18	" 21	a
Walter J. Quick	"	"	19.2	11	10.4	79.1	Very sandy loam . . . .	. . .	May 11	" 21	a
Calvin My	"	"	17.5	7	6.6	70	Sandy loam . . . . .	. . .	May 11	Oct. 29	a

P. M. Boyden	Brooklyn	Vilmorin	10.5	11	10.4	84.5	Clay loam	May 11	Nov. 22	a
William A. Morgan	"	Klein	16.6	10.3	9.8	81.1	Sandy loam	June 7	" 22	c
Calvin Mathews	"	Vilmorin	11.3	12.7	12	83.4	Yellow clay loam	May 7	Oct. 31	a
John Canatsey	Morgantown	"	16.8	9.4	8.9	76.2	Sandy loam	April 18	Nov. 9	a
Oliver H. Mills	Moorestville	"	12.6	10.5	10	80.1	Sandy loam	May 24	" 18	a
W. J. Knox	Brooklyn	"	9.8	10.5	10	77.2	"	" 9	" 19	b
C. M. Lindley	"	"	14	13.4	12.7	83.7	Clay loam	June 5	" 21	a
F. W. Fields	"	"	10.5	9.2	8.7	74.2	Clay loam	May 15	" 21	b
Wm. A. Plummer	"	Klein	17.5	10.1	9.6	76	Light sandy loam	" 20	" 22	a
R. D. Lockwood	"	Vilmorin	9.6	10.5	10	83.3	Clay loam	" 15	" 22	a
George Harmon	"	"	17.5	9.5	9	83.3	Clay loam	" 15	" 22	c
R. D. Fansler	"	"	18.3	9.9	9.4	81.8	Clay	" 17	" 22	b
James M. Dyke	"	"	12.2	9.2	8.7	80.7	Sandy loam	" 15	" 22	b
J. W. Stroder	"	"	13.1	9.3	8.8	81.5	Sandy loam	" 15	" 22	b
Abe Griggs	"	Klein	15.7	6.2	5.9	64	Clay	" 20	" 22	b
Seymour Kirchen	"	"	14.8	11.1	10.5	89.5	Clay loam	" 10	" 22	b
John S. Swope	"	Vilmorin	10.5	11.5	10.9	88.4	Black clay loam	" 10	" 22	b
Newton Co.										
C. J. Goodall	Morocco	Klein	4.3	10.3	9.8	82.4	Light sandy loam	April 30	Oct. 13	b
George L. Wood	Chicago, Ill.	"	13.1	9.5	9	80	Sandy loam	June 10	Nov. 1	b
Noble Co.										
G. M. Galloway	Cromwell	Klein	11.9	10.4	9.9	78.8	Black loam	May 13	Oct. 14	b
G. S. Bricker	Swan	"	13.1	14.4	13.7	87.1	"	" 18	Nov. 4	c
Cornelius Ott	Wolf Lake	"	15	8.5	8	72.6	Mucky	Apr. 30	" 9	b
Owen Co.										
C. E. Alverson	Carp	Klein	16.1	9.4	8.9	80.3	Clay	May 18	Oct. 29	a
Parke Co.										
Alanson Elliot	Montezuma	Klein	14	10	9.5	77.5	Sandy creek bottom	Apr. 18	Nov. 7	c
William Hadley	Bloomington	"	12.2	12.5	11.9	84.4	Bottom	May 12	" 3	c
F. W. Day	Mansfield	"	4.5	8.1	7.7	77.1	Sandy	Apr. 30	" 10	b
Porter Co.										
M. Wahl	Hebron	Klein	35.1	14.1	13.4	86	Black sand	Apr. 30	Dec. 2	b
Martin Nichols	"	Vilmorin	19.8	12.7	12	83.6	Sandy loam	May 20	" 16	a
Henry Lemster	Valparaiso	"	13.4	14.1	13.4	87	"	" 10	Nov. 1	b

TABLE II.—CONTINUED.

NAME.	Post Office.	Variety Beet.	Average Weight, Ounces.	Per Cent. Sugar in Juice.	Per Cent. Sugar in Beet.	Purity.	Class of Soil.	Tons per Acre.	Date of Planting.	Date of Harvest.	Cultivation.
Pulaski Co.											
Perry Wilson.	Winamac	Klein	5.9	14.8	14	92.4	Sandy loam	14.8	May 10	Oct. 31	b
J. A. Name.	"	"	15.7	15	14.2	88.7	Black sandy loam		" 10	Nov. 14	c
William Thews.	"	"	9.1	14	13.3	91.5	Black loam	10.8	" 11	Oct. 28	c
William H. Hornbeck	"	"	8.7	12.8	12.1	84.2	Sandy loam	13.7	" 20	Nov. 1	a
M. L. Utterback	"	"	5.2	17.1	16.2	92	Black sandy loam	7.6	" 6	" 8	c
L. L. Garringer.	"	"	17.5	15.1	14.3	89.3	"		"	" 11	d
Putnam Co.											
S. N. Harshberger . . .	Roachdale.	Klein	12	6.4	6	64.3	Sandy loam		Apr. 18	Sept. 24	c
A. C. Leckridge	"	"	7.6	9.1	8.6	78.4	"		"	Oct. 8	d
H. G. Woody	Greencastle	"	22.4	8.8	8.3	72.1	Clay		Apr. 20	Nov. 28	a
Shelby Co.											
O. F. Clendenen.	Bengal.	Vilmorin	22.5	10.9	10.8	75.5	Light sandy clay		Apr. 23	Nov. 10	a
O. H. Clapp.	Shelbyville	"	10.5	12.3	11.7	85.4	Clay and black	14.4	" 28	Dec. 2	a
James Tracy	Fountaintown.	Klein	12.2	12.2	11.6	87.1	Sandy clay.	16.3	May 7	Nov. 8	a
Spencer Co.											
LaSalle G. Shrede. . .	Grand View	Klein	9.8	11.9	11.3	81.4	Sandy loam	8.7	May 26	Nov. 8	a
Starke Co.											
James Wilson	North Judson	Klein	11.1	14.3	13.6	90	Sandy loam	13.7	May 12	Oct. 13	a
Jacob Kellar	"	"	24.5	15.1	14.3	91.5	Black sandy loam	33	" 12	Dec. 8	a
Frank Ross.	"	"	14.7	13.3	12.6	86	Sandy		" 7	Oct. 23	a
Frank Ross.	"	Vilmorin	11.9	14.8	14	93.8	"		" 5	Oct. 23	a
J. Dieneski.	"	Klein	31.5	13.6	12.9	94.9	"		"	Sept. 22	d
J. Dieneski.	"	Vilmorin	30.4	14.1	13.4	88.5	"		"	Oct. 23	d
Abe Hipelino.	Bass Lake.	Klein	22.4	12.5	11.9	86.3	Black sandy loam		May 17	" 27	a
A. M. Hurst	North Judson	Vilmorin	6.3	12.7	12	60	Sandy		"	" 28	b

Martin Vanoskey	North Judson	Klein	30.1	16	15.2	94.1	Sandy loam	...	May 3	Nov. 22	a
Mike Burijsansk	"	"	16.4	13.2	12.5	86.3	"	"	"	Oct. 13	a
Mike Burijsansk	"	Vilmerin	11.7	13.6	12.3	92.5	Black sandy	...	May 17	Nov. 22	a
H. H. Engleth	"	Klein	11.7	13.5	12.8	88.2	"	...	May 12	Oct. 15	a
H. H. Engleth	"	Vilmerin	12.7	13	12.3	93.6	Black sandy	...	May 12	Nov. 16	a
Jacob Jouski	"	Klein	12.9	9.8	9.3	79	"	...	"	Oct. 15	d
August Spinner	"	"	19.2	14.8	14	84	"	...	"	Nov. 4	d
W. H. Bunge	"	"	15.2	11.4	10.8	91.2	"	...	"	Nov. 21	d
Theodore Jordan	"	"	17.5	12.9	12.2	88.3	Sandy loam	...	May 17	Nov. 17	b
James Venek	"	"	20.4	13.4	12.7	83.7	"	...	"	Oct. 22	d
Mikel Riste	"	"	15.9	10.8	10.2	86.4	"	...	"	"	d
John Hopp	"	"	12.2	14.9	14.1	93.8	"	...	"	"	d
Peter Sebena	Hamlet	"	18.9	12	11.4	88.2	Black sandy loam	...	May 5	Nov. 22	a
Chas. Dahlka	North Judson	"	17.5	15.5	14.7	91.1	"	...	"	"	b
Chas. Kortrum	"	"	17.5	12	11.4	90.2	"	...	"	"	b
John Stasny	"	"	14.7	16	15.2	96.3	"	...	"	"	d
John Ludka	"	"	15.7	14.6	13.8	89	"	...	"	"	b
Edward Roney	"	"	26.2	15.1	14.3	86.2	Sandy	...	May 10	"	b
Henry Gearstadt	"	Vilmerin	21	15.3	14.5	93.2	Sandy loam	...	"	"	a
Henry Gearstadt	"	Klein	26.2	14.7	13.9	90.7	Sandy	...	"	"	b
John Budtka	"	"	23.4	15.3	14.5	92.1	Yellow sand	...	"	"	a
August Adam	"	"	23.9	13.6	12.9	88.2	Black sandy	...	"	"	b
Mike Ringhand	"	"	19	13.3	12.6	84.7	Sandy loam	...	"	"	b
Frank Boryanack	"	"	22.2	14.6	13.8	89.1	"	...	"	"	d
Frank Boryanack, Jr	"	"	14	15	14.2	93.7	Dark sand	...	May 18	"	a
H. Hardesty	Hamlet	"	18.9	16.8	15.9	93.4	Sandy loam	...	"	"	a
H. A. Ellingson	"	"	17.5	14.3	13.6	92.2	Dark sandy	...	May 13	"	a
St. Joseph Co.											
H. H. Swain	South Bend	Klein	17.8	16	15.2	93.5	Light sandy loam	...	Apr. 28	Nov. 7	b
Chas. Cole	Mishawaka	Vilmerin	9.8	12.7	12	82.4	Sandy	...	May 16	Nov. 4	a
George F. Newton	South Bend	"	14.0	13.5	12.8	92.5	Sandy loam	...	Apr. 30	Oct. 12	a
F. J. Metzger	"	"	14.7	14.7	13.9	84	Clay loam	...	May 13	Nov. 14	a
J. W. Snoke	"	"	14.7	13.8	13.1	83.1	Sandy	...	Apr. 12	"	a
Samuel Judie	Mishawaka	Klein	31.5	14.5	13.7	92.5	Sandy loam	...	May 26	Oct. 26	c
Horace Martin	South Bend	"	16.1	16.1	15.3	90.9	Sandy	...	"	"	b
Chas. Stuckey	"	Vilmerin	24.1	13.7	13	84.5	Sandy loam	...	"	Nov. 1	a
John Hummer	"	Klein	24.5	15.3	14.5	93.3	Sandy gravel	...	"	"	b
Steuben Co.											
W. H. Lemmon	Crooked Creek	Vilmerin	18.9	14.5	13.7	87.3	Gravel	...	May 30	Nov. 5	b
Chas. McClue	Angola	"	18.2	15.2	14.4	88.9	Light sand	...	"	Dec. 12	a

TABLE II.—CONTINUED.

NAME.	Post Office.	Variety Beet.	Average Weight, Ounces.	Per Cent. Sugar in Juice.	Per Cent. Sugar in Beet.	Purity.	Class of Soil.	Tons per Acre.	Date of Planting.	Date of Harvest.	Cultivation.
Tippecanoe Co.											
J. R. Robinson	Battle Ground.	Vilmorin	18.9	11.6	11	80	Black sandy loam. .	19.6	Apr. 25	Nov. 5	a
John R. Mahin	"	Klein	20.3	13.5	12.8	87.6	Clay loam.	15.2	May 10	Nov. 16	a
Station	Lafayette	Vilmorin	7.9	11	10.4	86	Dark loam.		Apr. 27	Sept. 7	a
"	"	Klein	5.9	11.8	11.2	84.3	"		" 27	" 13	a
"	"	Vilmorin	6.4	11.5	10.9	91	"		" 27	" 13	a
"	"	Klein	5.7	12.2	11.6	93	"		" 27	" 21	a
"	"	Vilmorin	6.2	12.3	11.7	93.8	"		" 27	" 21	a
"	"	Klein	4.5	11.5	10.9	95	"		" 27	Oct. 19	a
"	"	Vilmorin	6.1	11.9	11.3	85.6	"		" 27	Oct. 19	a
"	"	Klein	6	12.6	12	91.3	"		" 27	Nov. 2	a
"	"	Vilmorin	8.7	12.8	12.1	87	"		" 27	Nov. 2	a
"	"	Klein	4.3	14.1	13.4	90.4	"		" 27	" 8	a
"	"	Vilmorin	6.7	11.5	10.9	83.3	"		" 27	" 8	a
"	"	Klein	7	12.3	11.9	89	"		" 27	" 8	a
Tipton Co.											
Lee Goodwin	Curtisville. . . .	Vilmorin	14.9	13.5	12.8	86	Black loam		May 7	Sept. 30	a
Lee Goodwin	"	Klein	17.5	14.5	13.7	88	"		" 7	Oct. 20	a
H. Hineman	"	Vilmorin	14	12.4	11.8	91.1	"	17.8	" 11	" 5	a
John R. Nash.	Tipton	Klein	24.5	11.3	10.7	86.2	"	28.3	Apr. 28	" 10	b
W. S. Kelly.	Sharpsville	"	23.6	11.8	11.2	86.7	Black walnut		May 9	" 17	b
Frank E. Watson. . . .	Normanda	"	24.5	12.2	11.6	84.7	Clay	18.7	" 11	Nov. 23	c
John Vickers.	Curtisville. . . .	Vilmorin	19.2	15.8	15	94	Black	20.6	" 9	Oct. 27	a
F. M. Goodwin	"	Klein	19.2	12	11.4	83.3	Black loam		" 13	Nov. 3	a
S. Barrett	Windfall.	"	13.3	14.6	13.8	87.9	Elm swamp	28.8	" 10	" 7	a
Vanderburgh Co.											
Joseph Angel.	Evansville.	Klein	25	9	8.5	72.6	Sandy river bottom .	23.6	May 15	Oct. 11	d
Joseph Gibbs	"	"	7	12	11.4	89.2	"		" 15	" 23	a

Vermillion Co.	David Metzer.	Gessie.	Klein	30.1 11.2	8.4 11.6	8 11	70 84	Clay loam. Black timber . . . . .	. . . 12.2	May 10 " 12	Sept. 23 Oct. 24	c b
Vigo Co.	John L. Weis.	Terre Haute.	Klein	14 8.4	10.6 14.2	10 13.5	83.9 83	Black sandy. Heavy clay	14.3 10.8	May 2 " 18	Oct. 22 Nov. 9	b c
Wayne Co.	Andrew J. Eliason.	Richmond.	Vilmerin	12.6 11.7	11.8 12.9	11.2 12.2	84.8 85.4	Deep clay loam Clay	30 .	May 25 " 15	Nov. 10 Oct. 31	a a
White Co.	Thomas B. Allen.	Hagerstown	Klein	17.5	12 12	11.4	76.4	Sandy clay. . . . .	.	" 5	Nov. 14	a
Henry Armstrong.	Headlee	Headlee	Klein	17.5	14.5	13.7	87.3	Sandy loam	19.1	May 5	Nov. 4	a
Whitley Co.	Chas. Foster	Coesse	Klein	14 15.4	14.8 9.4	14 8.9	84 71.9	Loam Sandy . . . . .	. . . .	June 1 Apr. 20	Nov. 3 " 4	b b
George Williamson.	Dunfee.	Laud P. O.	"	22.2	14	13.3	77.8	Clay	28	June 1	" 30	c

SKIM MILK AS A FOOD FOR YOUNG GROWING CHICKENS.

W. B. ANDERSON, ASSISTANT AGRICULTURIST.

This experiment is essentially a duplication of the work reported in Bulletin No. 71 of this Station, on "Skim Milk as a Food for Young Growing Chickens." This second trial was intended to check and give support to the results of the previous one.

The fowls used were 20 young chickens, 10 Plymouth Rocks and 10 Houdans. Before the experiment began, the chickens ran at large and were given similar treatment and care. The two breeds were equally divided between the two lots. The chickens used varied somewhat in size, but were so divided as to get the initial weight of the two lots exactly the same.

Each lot received the same solid food, care and treatment, getting all the mixed food they would eat. In addition to the solid food, Lot II was fed all the skim milk the birds would drink. The mixed food was made up of equal parts of corn meal, shorts and ground oats. Green food consisting of rape, cabbage and lettuce was also given. Food was fed them at 7 a. m., noon and 6 p. m.

The fowls were weighed every Saturday afternoon about 4 o'clock. Food was weighed at each feeding, and the refuse once each day. No weights were taken of the water constantly kept in the pens.

Table I gives the weight of each chicken in Lots I and II at the beginning of the experiment.

TABLE I.

LOT I—WITHOUT MILK.		LOT II—WITH MILK.	
Number of Chicken.	Weight, Ounces.	Number of Chicken.	Weight, Ounces.
1	16	0	23
12	25	7	19
13	21	9	17
15	22	24	26
17	30	25	30
18	34	27	33
26	29	46	27
30	36	47	24
50	23	48	36
51	23	49	24
Total	259	. . . . .	259

The above table shows the combined weight of each lot to be exactly the same July 9, at the beginning of the experiment. A comparison of the separate weights of the chickens in each lot indicates uniformity in the selection of the fowls, to balance one lot against the other, chicken for chicken.

In Table II is shown the total food consumed for each week, and the weekly weight of fowls for the entire experiment of six weeks or 42 days.

TABLE II.

OUNCES OF FOOD CONSUMED.				WEIGHT OF FOWLS.	
Lot I.		Lot II.		Lot I.	Lot II.
Date.	Mixed Food.	Mixed Food.	Milk.		
July 16	119	159.5	119	279 ozs.	299 ozs.
July 23	90.5	122	95.5	297 "	331 "
July 30	106.5	124	101.5	320 "	362 "
August 6	141	165	143.5	348 "	407 "
August 13	128.5	157	139	361 "	444 "
August 20	146.5	184.5	153.5	385 "	489 "
Total food consumed.	732	912	752		

Lot II consumed 180 ounces, or 11¼ pounds more of mixed food than lot I. In addition, lot II consumed 751 ounces or 46 lbs. 15 ozs. of milk. This indicates that milk is of more value in feeding young poultry than is represented by its mere food value. It increases the consumption of other foods.

In Table III is shown the weekly gain per lot and per chicken.

TABLE III.—WEEKLY GAIN PER LOT AND PER CHICKEN.

DATE.	LOT I—WITHOUT MILK.		LOT II—WITH MILK.	
	Total Gain.	Average Gain Per Chicken.	Total Gain.	Average Gain Per Chicken.
July 16	20 ozs.	2.0 ozs.	40 ozs.	4.0 ozs.
July 23	16 "	1.6 "	32 "	3.2 "
July 30	23 "	2.3 "	31 "	3.1 "
August 6	28 "	2.8 "	45 "	4.5 "
August 13	13 "	1.3 "	37 "	3.7 "
August 20	24 "	2.4 "	49 "	4.9 "
Average gain per week . .		2.066 ozs.		3.9 ozs.

The above table brings out the great value of skim milk to secure increase in live weight. The first week the average gain for the skim milk lot was twice as great as for the lot without milk. This table does not, however, tell the whole tale. The chickens in Lot I were so off their feed and out of physical condition, that one week (August 20 to 27) of the feeding record has been rejected. One fowl of Lot I died and two or three others clearly showed great physical weakness. Because of this the advantage of skim milk in producing gain would be magnified, hence, these weights were rejected.

The greatest gains made by Lot II were between the dates July 9 to 16; July 30 to August 6, and August 13 to August 20 (Table III). Upon consulting Table II, we find, with the exception of July 9 to 16 (the first week), that the greatest quantities of milk were consumed during these periods.

Also Lot II consumed greater quantities of mixed foods during these periods. It appears that the increased consumption of milk is simultaneous with an increased consumption of mixed food, which results in greater gains. Lot I consumed more mixed food than usual during these intervals, and also made more than usual gains.

Table III also brings out the fact that the weekly gains in Lot I were much smaller than those of Lot II.

In Table IV the weight of each chicken in Lots I and II, at the beginning of the experiment and at its close, is given.

TABLE IV.—THE INITIAL AND FINAL WEIGHTS OF LOTS I AND II.

NUMBER CHICKEN.	LOT I—WITHOUT MILK.			NUMBER CHICKEN.	LOT II—WITH MILK.		
	Weights, Ozs.		Gain.		Weights, Ozs.		Gain.
	First.	Last.			First.	Last.	
1	16	26	10	0	23	33	10
12	25	36	11	7	19	49	30
13	21	31	10	9	17	45	28
15	22	36	14	24	26	47	21
17	30	45	15	25	30	43	13
18	34	66	32	27	33	57	24
26	29	35	6	46	27	61	34
30	36	60	24	47	24	45	21
50	23	29	6	48	36	71	35
51	23	31	8	49	21	68	47
Total	259	385	126	Total	259	499	240

In Table V the amount and kind of green food given to each lot is shown for the different feeding periods.

TABLE V.—GREEN FOODS CONSUMED.

DATE.	LOT I—WITHOUT MILK.		LOT II—WITH MILK.	
	Rape.	Cabbage.	Rape.	Cabbage.
July 16	3 ozs.	. . . . .	3 ozs.	. . . . .
July 23	1 "	6 ozs.	1 "	6 ozs.
July 30 . . . . .	. . . . .	11 "	. . . . .	11 "
August 6 . . . . .	. . . . .	10 "	. . . . .	10 "
August 13 . . . . .	. . . . .	7 "	. . . . .	7 "
August 20 . . . . .	. . . . .	9.5 "	. . . . .	9.5 "
Total consumed	4 ozs.	43.5 ozs.	4 ozs.	43.5 ozs.

The refuse could not be deducted from the amount of green food given. The decrease in weight due to evaporation would make the weight of refuse too small, and decrease in weight due to evaporation would be counted as increased food consumed. The aim was to feed just enough to have all material eaten.

The important point in this table is the fact that the chickens fed milk also ate with apparently as much relish the same quantity of green food as the lot that received no milk.

The price of the food products used was taken from the LaFayette markets when the experiment began. Oats was valued at 80 cents per 100 pounds, corn meal at 80 cents per 100 pounds and shorts at 60 cents. Skim milk is worth 20 cents per 100 pounds for feeding.

The amount and cost of food to produce one pound of gain is shown below. The consumption of green food was so nearly the same that no account of it was taken in making estimates.

	Lot I—Without Milk.	Lot II—With Milk.
Ate of mixed food.....	46.67 lbs.	57 lbs.
Gain in weight.....	7¾ lbs.	14⅝ lbs.
Cost of food.....	33½ cts.	52½ cts.
Cost of food to pound of gain.....	4½ cts.	52½ cts.
Nutritive ratio of food fed.....	1:6.7	1:2.4

The total gain of Lot I was 7¾ pounds; that of Lot II, 14⅝ pounds. The addition of milk to the ration cheapened the actual cost of the food, as well as kept the chickens in a healthier condition.

The cost of producing one pound of gain, live weight, was nearly one cent less when skim milk was used as a part of the ration.

The addition of milk to the ration of Lot II makes it a very narrow one. when compared to the ration given to Lot I.

In the former, the amount of protein in the food is nearly one-half as great as that of the carbohydrates; in the latter, the protein is not one-sixth as much as the carbohydrates contained in the ration.

Since a ration having a nutritive ratio of 1:6.7 would keep young animals, as pigs, calves, etc., in a fairly good growing condition, it seems evident that young chickens may not digest and assimilate the nutrients from the mixed food given them, as do other animals.

In Table VI the gain made by each chicken in both lots is shown in comparison with the gains made by each fowl in the 1897 experiment. (See Bulletin 71).

TABLE VI.

LOT I—WITHOUT MILK.		LOT II—WITH MILK.	
1897 Trial.	1898 Trial.	1897 Trial.	1898 Trial.
24.0 ounces. *	10 ounces.	37.5 ounces.	10 ounces.
26.5 "	11 "	39 "	30 "
23.5 "	10 "	35 "	28 "
16.5 "	12 "	32 "	21 "
19.5 "	15 "	35.5 "	13 "
18.5 "	22 "	49 "	24 "
24 "	6 "	29 "	24 "
16 "	24 "	35 "	21 "
24 "	6 "	30.5 "	35 "
	8 "	33 "	24 "
Total gain, 192.5 ozs.	124 ounces.	355.5 ounces.	230 ounces.
Average gain, 158.25 ounces.		292.75 ounces.	

This table clearly indicates the peculiar difference in chickens to take on increase in weight.

Where milk is used as a part of the ration, the increase varies from 10 to 30 ounces. In the lots receiving no milk the variation is from six to 24 ounces.

In breeding cattle, hogs and sheep, the tendency of some animals to lay on flesh more than others has been fully recognized. This ability is accumulated by selection. The same selection and accumulation, it seems, might be accomplished with fowls.

The gains made in the two trials by the lots receiving no milk are practically the same. The weak physical condition of the fowls, and even death, was characteristic of both trials, thus indicating that green grass, lettuce, cabbage, rape, etc., can not be substituted for the food obtained by young chicks running at large.

*Died before experiment closed.

The lots receiving milk showed a greater variation in the average gain of the lots in the two trials. Yet the average of the two still shows a very decided advantage in feeding skim milk.

In the first trial the mixed food was measured, placed into a bucket and mixed wet and then immediately weighed. If any refuse was found, the water had largely evaporated from it. In subtracting the refuse (partially dry) from the food given (freshly wet), an error was made in that the chickens appeared to consume more food than really was consumed.

To eliminate this error, in the second trial, the different ground foods were weighed separately when dry and afterward mixed in enough water to prevent the food being wasted from the feed pans.

SUMMARY.

FIRST FEEDING TRIAL (Bulletin 71).

1. If skim milk be added to the ration fed to young chickens, it will increase the consumption of the other foods given.

2. The great increase in average gain was coincident with the periods when the greatest amounts of skim milk were consumed.

3. Skim milk is especially valuable as a food for young chickens during the hot, dry weather, and becomes of less importance as the chickens grow older and the weather becomes cooler.

SECOND FEEDING TRIAL.

1. The results of this trial are very similar to those of the previous one, with the single exception that skim milk did not decrease in value as a food for young chickens, as the chickens became older and cooler weather prevailed.

2. Green food given to young fowls confined in pens will not keep them in perfect health when getting a fairly balanced ration. This indicates that the young chickens are unable to digest and assimilate all the nutrients from the ground food.

3. Skim milk is a valuable food for chickens. Whether fed with a balanced ration or with green food, its influence is very great in securing increased weight and in maintaining the general health of the fowls.

4. The addition of skim milk to the ration increases the profits by decreasing the cost of the ration and by securing greater returns from the other foods given, especially when the chickens are young and confined in pens or small yards.

FIELD EXPERIMENTS WITH CORN.

W. C. LATTA, AGRICULTURIST, AND W. B. ANDERSON, ASSISTANT.

Introductory. In the field experiments with various farm crops two purposes have been kept steadily in view, viz: (1) To conduct the experiments under farm conditions and by the methods of good farmers, and (2) to eliminate the varying effect of season by continuing the work for a series of years.

In the following pages care is taken to show the number of years each experiment has been conducted and the average results attained.

EARLY AND LATE PLANTING.

This experiment has been conducted in its present form for seven years.

The following table gives the salient features of the experiment, with the results as to yield:

YIELDS FROM EARLY AND LATE PLANTINGS.

Date of Planting.	Number of Years.	Av. No. Bushels Per Acre.
May 1st to 2d	6	46.72
May 8th to 11th	7	41.99
May 15th to 16th	7	39.53
May 21st to 22d	7	41.27
May 28th to 30th	7	38.56

THICK AND THIN PLANTING.

With the exception of 1895, when the intense drouth practically ruined the crop, this experiment has been carried on continuously since 1885. The planting has been regularly done with a two-horse drill planter, set to drop the kernels, singly, at approximately the distances apart shown in the accompanying table. The corn rows have been placed uniformly three and two-thirds feet apart.

* May 1st planting omitted in 1892.

YIELDS PER ACRE FROM THICK AND THIN PLANTING.

STALKS—INCHES APART.	Number of Years.	BUSHEL ^S .	
		1898.	Average.
Six	1	28.3	. . . . .
Eight	1	37.6	. . . . .
Nine	1	47.7	. . . . .
Ten to eleven	12	58.8	42.0
Twelve to thirteen	11	. . . . .	43.2
Fourteen	11	. . . . .	43.2
Fifteen	1	60.5	. . . . .
Sixteen	11	. . . . .	38.4
Seventeen	1	60.3	. . . . .
Nineteen	11	. . . . .	37.9
Twenty-three	1	57.5	. . . . .

The introduction of several new rates of planting and the abandonment of three of the old rates were due to a change in planters in 1898. For this reason the yields for 1898, as well as the average yields, are given in the table. The average yields, both of grain and stalks, were greatest when the stalks stood twelve to fourteen inches apart. In very dry seasons thin planting has not only produced a larger yield of grain, but a larger proportion of ears to the yield of stalks.

DEEP AND SHALLOW CULTURE OF CORN.

This experiment has been conducted eight years, with the exception of the plat cultivated four inches deep, which was added in 1894. The soil in which this experiment has been carried on is a dark compact loam, naturally drained by underlying gravel. The ground has been broken about eight inches deep each spring. The cultivation has been wholly with the spring tooth cultivator, and "one way" only, as the corn has been planted in drills. The yields from the different depths of cultivation are as follows:

BUSHEL^S PER ACRE FROM DEEP AND SHALLOW CULTURE.

<i>Depth of Cultivation.</i>	<i>Average of Eight Years.</i>
About one inch deep	42.18
About two inches deep	42.36
About three inches deep	42.56
About four inches deep	*37.92

It appears from the table that the maximum limit of culture for best yields on the Station farm is about three inches.

There is, of course, more root pruning at this depth than with a less depth, but it seems that the greater conservation of moisture fully com-

*Average of last five years.

pensates for the loss of the corn roots. The experiment will be continued.

EFFECT OF PREVIOUS MANURING ON YIELD OF CORN.

This experiment has been conducted continuously for 16 years. Fresh horse manure was applied in 1883 and again in 1884 to certain plats, amounting for the two years to about 50 tons to the acre. Every alternate plat was left without manure for comparison. The results are as follows:

Average yield manure plats.....	36.48 bu.
Average yield unmanured plats.....	28.24 bu.
Average increase from manure.....	8.24
Increase, the 16th year, from manure.....	3.50
Aggregate increase from manure.....	131.81

The above is a striking showing, both as to the aggregate and lasting effect of horse manure. The actual results must be even better than the figures above indicate, as the manured and unmanured plats lie side by side, which fact must have been favorable to the unmanured plats.

CONTINUOUS CORN CULTURE WITH AND WITHOUT FERTILIZATION.

This experiment was begun in 1889, but no fertilizer or manure was used that year, as the purpose was to ascertain the natural fertility of the several plats of the series.

Although corn is grown continuously on this series, winter rye is sown each fall and the resulting growth turned under the succeeding spring as green manure for the next corn crop. The grain and stalks have been regularly harvested and removed each year. Beginning with 1890, fertilizers and fresh horse manure have been applied each year to certain plats at the average rates indicated in the accompanying table, which also shows the yields per acre for 1898 and the average for nine years.

In computing the increased yields, the fertilizers and manure are credited with the gains on the inter-plats (not shown in the table), due to diffusion of plant food and cross feeding.

YIELDS AND INCREASE FROM FERTILIZATION IN CONTINUOUS CORN CULTURE.

Number.	KIND OF FERTILIZATION.	Average No. Lbs. Fertilizer.	Bushels in 1898.		Average of 9 years.	
			Yield.	Increase.	Yield.	Increase.
1	Nothing		45.57	. . . . .	39.84	. . . . .
2	{ Acid phosphate Ammonic sulphate*. Muriate of potash.	{ 250 432 112 }	56.32	14.50	43.44	8.45
3	{ Acid phosphate Ammonic sulphate*. Muriate of potash.	{ 143 184 74 }	57.57	16.96	43.80	8.25
4	Nothing		42.57	. . . . .	38.16	. . . . .
5	Horse manure	14,500	56.29	20.96	45.37	10.59
6	Horse manure	9,667	57.86	20.36	44.28	8.01
7	Nothing		39.50	. . . . .	36.34	. . . . .

The gains for the fertilizers and manure in 1898 are very satisfactory but the average increase in yield does not justify the expense involved. It should be remembered, however, that the system of cropping is not well calculated to effect a full utilization of the manure and fertilizers.

FIELD TESTS OF CULTURAL IMPLEMENTS.

This experiment was begun 10 years ago. At first the corn was planted in drills, but in 1893 the plan was changed to permit the trial of the implements in both hill and drill corn.

In all the hill-planted plats, cultivation with each implement has been in two directions.

In the following table the yields of the hill and drill plats have been thrown together, and their average yields only are given.

YIELDS PER ACRE WITH CULTURAL IMPLEMENTS.

Cultivator Used.	Years Under Trial.	Av. No. Bushels.
Albion spring-tooth.....	10	54.34
Corn plow	10	52.80
Hoosier cultivator.....	9	48.68
Tower's cultivator.....	6	53.10
Breed's weeder and harrow.....	5	48.77
Hoke cultivator.....	1	†67.75

*Nitrate of soda, supplying an equivalent amount of nitrogen, was substituted the last three years of the experiment.

† Crop of 1898 only.

It will be observed that the differences in yield are slight. It is quite possible that the order would be reversed in some instances on a very different soil. Taking everything into account, the spring tooth cultivator is considered the best for soils like that of the Station farm.

HILL AND DRILL PLANTING OF CORN.

This experiment has been carried on continuously for the last five years.

The first year there were 18 hilled and 27 drilled plats. In each of the remaining four years there were 27 hilled and 18 drilled plats. The hills were three and one-half feet apart each way, with three stalks to each hill. An equal stand of corn was grown on the drill plats, the rows being three and one-half feet apart, and the individual stalks 14 inches apart in the row.

In the following table the actual and corrected yields per acre are shown for the five years. The corrected yields are, of course, theoretical; that is, based on perfect stand.

	<i>Bushels Per Acre.</i>	
	<i>Actual.</i>	<i>Corrected.</i>
Average yield 126 hill plats.....	50.57	55.27
Average yield 96 drill plats.....	50.77	54.55

The differences in yield are so slight that other considerations—convenience in planting and cultivating—should decide which method of planting to use.

SUMMARY.

1. Planting corn early in May has given best results on the Indiana Experiment Station farm, as a rule.
2. The greatest average yields of both ears and stalks have been obtained when the stalks stood 12 to 14 inches apart.
3. Thick planting has reduced the size of the ears and the per cent. of grain.
4. Thick planting has in dry seasons produced the heaviest yield of stalks and the lightest yield of ears.
5. The yields of corn from cultivation one, two and three inches deep have been about equal.
6. Cultivation four inches deep has considerably reduced the yield of corn.
7. Heavy applications of manure and fertilizers have not proved profitable in continuous corn culture.

8. In continuous corn culture the effect of a heavy application of fresh horse manure has not been exhausted in 15 years.

9. Cultural implements differing much in construction and action upon the soil have produced nearly the same yields of corn.

10. Of the several cultural implements under trial, preference is given to the spring-tooth cultivator for soils similar to that of the Station farm.

11. The Hoke cultivator, on account of its high arch, can be used several days later in the corn field than the other two-horse cultivators under trial.

12. Hill and drill plantings of corn have produced practically the same average yields.

MANGEL WURZELS AND THE COST OF PRODUCTION.

BY H. E. VAN NORMAN, FARM SUPERINTENDENT.

The need of some succulent feed in the ration for dairy cattle especially, and its possible value for sheep and even hogs, makes it necessary to consider the different crops which may profitably furnish this succulence. The root crops are largely used by some feeders with desirable results. On many farms a small area can be devoted to one of these crops to advantage, giving a variety of feed for winter use.

During the season of 1898 two acres of mangels were grown on the Station farm. Careful record was kept of all labor, with a view to knowing the actual labor cost of growing the crop.

SOIL.

The plats available were a loam soil of good quality, well underdrained by a gravel subsoil, coming to within 18 to 30 inches of the surface.

FITTING.

This ground was thoroughly manured during the early spring. It is desirable that this be fine or well rotted manure, that it may be turned completely under, so as not to interfere with the drilling. The plowing was done the last week in April, then rolled with a clod crusher and harrowed. Two or even three harrowings are not a waste of time, in order to secure a fine seed bed. A plank drag was used last to make as smooth a surface as possible for drilling in the seed with the hand drill. In addition to greater ease in pushing the drill, the smooth, fine surface makes possible an earlier cultivation with a horse and cultivator, and getting closer to the rows when the plants are small, making less hand work to be done. The amount of hand hoeing is the most serious drawback in the growing of root crops, hence the importance of not allowing the weeds such a start as to make the hand hoe necessary, except for first thinning.

VARIETIES AND PLANTING.

One-half acre was devoted to each of the following standard varieties, secured from a reliable seed house: Champion Yellow Globe, Giant Yellow Intermediate, Golden Tankard and Mammoth Long Red. The seeding was done on May 3, 1898, with a Planet Jr. hand garden drill, at the rate of six pounds of seed per acre. The rows were 30 inches apart. Rows closer than 30 inches are satisfactory, if the horse to be used for cultivation is a good one for narrow rows.

THINNING.

It is desirable to have a thick, even stand, so as to insure a plant every eight or ten inches. When thinning, the man should be able to go along with a hoe and strike out eight inches of the row, leave two inches and strike out eight again, and be sure that each space left untouched by the hoe will contain at least one healthy plant. If the seeding is light, there will be spaces of two to six inches without a single plant, and frequently in striking out, the block will fall on these vacant spots, unless time is taken to select and vary the distance according to the distribution in the row. This is more expensive in the end than to buy a few pounds more seed at first.

From the little blocks left all but one strong plant must be pulled by the fingers. If this is carefully done, with thorough use of the cultivator, little more hoeing will be needed. The thinning should be done as soon as the plants are about two inches high. It is very desirable that only one plant be left in a place, as two crowd each other and do not mature fully.

CULTIVATION.

The plats received four cultivations, three with a spike-tooth cultivator and the last time with a Planet Jr., with a chain dragging behind, to smooth down the small ridges, making a fine dust mulch. In addition to this the weeds in the rows were cut out with a hoe once.

If at hand, a Breed's weeder, or similar light tool, might be run over the field just before the plants show through the ground; this would give them a good start ahead of the weeds.

In addition to keeping free from the weeds, cultivation should be frequent enough to keep the soil loose and conserve moisture, for every ton of roots contain 1,800 pounds of water, which must come largely from the soil.

Harvesting was begun November 2. With both hands the dead and drooping leaves were lifted and used to pull the root; a twist or jerk of the hand dropped it in a windrow, composed of three rows, for con-

venience in loading. The numerous sprouts or suckers around the top increased materially the time required for pulling, in some cases taking one-third longer where rows were the same length. The Giant Yellow and the Long Red were almost free from this objection. These two varieties were also easier to pick up because of the neck-like top, instead of the more spherical shape of the other varieties. Some of these latter were large and round enough to hinder a little in picking up readily with one hand, necessitating the fumbling for a good hold.

YIELD.

The following is the yield, per acre, of each variety.

Champion Yellow Globe.....	24 $\frac{1}{4}$ tons.
Giant Yellow Intermediate.....	25 $\frac{1}{4}$ tons.
Golden Tankard.....	17 tons.
Mammoth Long Red.....	16 $\frac{1}{2}$ tons.

COST.

The following figures show the cost of production and handling the crop from two acres.

Plowing and fitting; man and team.....	14 hours	\$3.50
Drilling; man.....	7 hours	.88
Hoeing and thinning.....	134 hours	18.27
Cultivating; man and horse.....	14 $\frac{3}{4}$ hours	2.80
Harvesting; man and team.....	34 $\frac{1}{2}$ hours	8.67
Harvesting; men only.....	67 $\frac{1}{2}$ hours	8.43
		<hr/>
		\$42.55

A total of 40 $\frac{3}{4}$ tons from two acres cost \$42.55 or \$1.04 per ton, while the largest yield cost only 85 cents per ton, allowing an equal amount of labor on each plat.

STORAGE.

Half of the crop was placed in an abandoned silo and covered with straw and fodder, while the remainder was placed in a pit. The mangels were piled in a long "A" shaped pile, covered with straw and then with dirt. Ventilators of tile or three pieces of board nailed together should be put every 12 or 15 feet in such a pit.

Where so pitted and suitably covered with a layer of soil, so as to shield the roots from winter freezing, they should keep in good condition. The depth of such a covering will depend on the exposure of the pit, kind of soil used for covering, and part of the country located in.

FORMALIN FOR GRAIN AND POTATOES.

BY J. C. ARTHUR, BOTANIST.

Among the most notable advances of recent years in the treatment of crops, none has a more direct bearing upon the success of the cultivator than the use of preventives for specific plant diseases. In horticulture and floriculture, where intensive methods are most practiced, spraying and fumigation, together with some other forms of application, have become the customary procedure with all careful growers. In agriculture the advance along this line has been by no means so great. In farm operations only relatively simple and inexpensive methods are likely to find much favor, owing to the large bulk of seed that must be treated or the large area of growing crops to be dealt with and especially as the operations must as a rule be given over to unskilled labor. But there is good reason for believing that many, if not all, of the more destructive diseases that vex the farmer, and scale down or obliterate his profits, will eventually be brought under the possible control of the thrifty husbandman.

WHEAT, OATS AND CORN.

Fifteen years ago, at the New York Experiment Station, the first field count of smutted heads of oats was made, by which the conclusion was reached that on an average ten per cent. of a crop may be lost without materially affecting the general aspect of the field, or giving adequate evidence of the loss to any but a practised eye. The comparative inconspicuousness of the smutted part of the crop as casually viewed in the field is doubtless the reason why the heavy losses which farmers sustain from this cause in general excite so little comment and apprehension.

Many estimates of losses have been made since 1884 in a number of the northern States by counting all the affected and unaffected heads over certain parts of the field, and these have shown from 0 to 60 per cent. of injury for oat smut, with a probable average loss for the whole country, taking one season with another, of between 8 and 10 per cent. Other kinds of smut may be even more destructive at times, but none is so remarkably constant in invading all fields in all seasons, where not protected by treatment.

The grain smuts may be divided into three classes in regard to treatment:

First. The infection is by wind-blown spores, affecting only small areas of the plant here and there at the spots where the spores alight. In this case treating the seed does no good, as the fungus does not start with the seed. It is necessary, on the contrary, to protect the whole surface of the plant above ground. Corn smut is of this nature, and the remedy is to spray the field a number of times with Bordeaux mixture, which has been found effective, but is not considered practical; or to gather the smut balls from the field while the crop is growing or at any other time and burn them, so that the spores can not be scattered and continue the attack upon the same or subsequent crops. The latter method is feasible and advantageous, and if followed up, will do much to reduce and prevent corn smut.

Second. The infection comes only or chiefly from spores attached to and sown with the seed, and with the death point of both spores and seeds, for such fungicidal agents as have been tried, so nearly the same that a satisfactory remedy is not yet available. The loose (black) smut of wheat is of this character. Whatever kills the spores on the seed grain kills the grain itself more or less completely. By a nice adjustment of the hot water treatment the loose smut can be cleaned out but with a heavy sacrifice of the seed, which is an uncertain and unprofitable procedure unless one desires to obtain a clean crop without regard to expense or trouble. It is hoped that formalin can in some manner be made to meet the conditions, but the experiments now under way are not sufficiently advanced to permit of opinion. At present there is no satisfactory remedy or preventive to be recommended for this kind of smut.

Third. The infection is by way of the seed, as in the last case, but the death point for a number of fungicidal agents is much lower for the spores than for the seeds, and it is only necessary to treat seed grain in the proper manner to entirely kill the smut without injury to the seed. In fact often with distinct benefit to the seed, and thereby secure a maximum crop free from smut. Of this sort are the oat smuts, and the hard (stinking) smut of wheat. There are a number of efficient remedies for these smuts: The copper sulfate (blue stone) treatment has been practiced for more than a century; the hot water treatment is excellent and has met with much deserved favor; potassium sulfide, corrosive sublimate, "ceres pulver," and other substances, have been found serviceable.

A fungicide, however, which outweighs all others in efficiency, and convenience of application, is formalin. This was first tested with some fulness, and recommended as a practical remedy for smut, by Professor H. L. Bolley* of the North Dakota Station. Its action on seeds and spores has been studied in a subsidiary way by a number of investigators, both in and outside of the experiment stations, but a full account of the subject must be left for another time. In this place only enough of the orig-

* N. D. Bulletin No. 27, March, 1897.

final data will be given to somewhat substantiate the general claim for the practical character of the proposed treatment.

The method of treatment is very simple: Add one-half pound of formalin to thirty gallons of water and immerse the seed for two hours, or wet the seed thoroughly by sprinkling and let it stand in a covered pile for the same length of time. Then spread and dry it sufficiently to sow in the usual manner.

Formalin can be obtained of almost any druggist, or can be ordered through one. It is supplied to the trade under two names: formalin and formaldehyde, sometimes varying in price, but both being a solution of formaldehyde gas in water of the supposed strength of 40 per cent.; so that it is immaterial under which name the substance is bought. The strength of the solution varies some, and it deteriorates slowly with age, but at the present time the only course open to the farmer is to accept what the druggist furnishes, and assume that it has the full strength of 40 per cent., or practically that. A pound of formalin is in volume a little less than one pint.

Formalin is retailed both from the bulk and in original sealed pound bottles, the latter being somewhat safer to use, as there has been less chance of deterioration, but is somewhat more expensive. The price is declining. It can now be had for one dollar a pound or less, even as low as fifty cents from some large dealers.

The substance is a pungent gas, dissolved in water, being somewhat like ammonia in this respect. It is very irritating to the eyes and nose, and under too long exposure may naturally cause injury. It also produces a smarting of spots where the skin is removed, but is not likely to do any harm aside from the unpleasant feeling. In short, the substance is not poisonous to man or beast, administered externally or internally, under ordinary conditions and modes of handling. Within reasonable bounds it is a harmless and safe material to use. It can be put into any kind of a vessel, as it does not corrode. The solution which is left over after treatment of seed, can be thrown out anywhere without endangering animals or plants, and if a moderate amount of the treated seed should be accidentally eaten by cows, hens, or other occupants of the farm, no harm is likely to follow.

The action of this substance is somewhat slower than that of the more common fungicides. It can not, therefore, be applied quite so rapidly, but on the other hand the range for safe application is far wider. If the seed should stay in the solution much longer than two hours, little or no injury would result to the grain, while the very last spores of the fungus would be all the more certainly reached. This is especially true for oats, as the seeds and spores are both much protected by the hulls. Yet the period of two hours fixed upon is about right for satisfactory treatment with the strength mentioned.

If more than one lot is to be treated, the same solution can be used

over a number of times, certainly four or five times, but the seed should be left in longer each successive time, as the solution is becoming constantly weaker.

The above recommendations are based upon fragmentary data, but it is believed that they are within safe limits, although undoubtedly they may need modification to adopt them to the best practice when more exact knowledge is obtainable.

In a test of fungicides upon oats, conducted in 1898, an immersion of seed for ten minutes in formalin solution of the strength of one pound to fifty gallons of water gave perfect germination of seed in the laboratory trial and only eight-tenths of one per cent. of smut in the crop, against over twelve per cent. in the crop from untreated seed. Two weaker solutions with the same length of immersion were tried with correspondingly poorer results. At that time the necessity for a long exposure to the action of the fungicide was not so fully recognized. Many laboratory experiments conducted by Mr. William Stuart, the assistant botanist, have since been tried by exposing the spores to various treatments and testing their germination by direct cultures in hanging drops, which have greatly helped to an understanding of the subject.

Several trials with formalin on wheat are in progress, and the data in the accompanying table taken from the records now available have interest in this connection. They show that so far as the seed grain is concerned, a treatment of two hours in a solution of the strength of one pound of formalin to fifty gallons of water is slightly, if at all, injurious to the after growth, whether tested by laboratory or field observations. For further results the harvest must be awaited.

FORMALIN TREATMENT OF WHEAT IN 1898-99.

SEED SOWN IN THE FIELD AFTER IMMERSION IN FUNGICIDE SOLUTION, IN SIMPLE WATER, OR UNTREATED.

DATE.	TREATMENT.		Laboratory Germination.	Field Germination.	Appearance April 10, 1899.
	Strength.	Time.			
Sept. 17 1898	1 lb. formalin . . .	2 hrs.	95.5	Good	Good
	50 gals. water . . .		95.5	Good	Good
Sept. 26 1898	2 lbs. formalin . . .	2 hrs.	89.5	Medium	{ Considerably injured
	50 gals. water . . .				
Sept. 26 1898	1 lb. formalin . . .	2 hrs.	95.5	Good	Good
	50 gals. water . . .		87.	Good	Good
Sept. 26 1898	Water at room temperature	½ hr.	98.	Good	Good
	2 lbs. formalin . . .	½ hr.	81.	Poor	{ Slightly injured
	50 gals. water . . .				

The work at the North Dakota Station, already referred to (Bulletin No. 27), gives strong warrant for believing that success may be attained when the seed is sprinkled with the formalin solution, instead of using a bath. By this method the seed is spread out on a floor, sprinkled until thoroughly wet with a solution of the same strength as already recommended, shoveled over rapidly to distribute the moisture evenly, then piled up and covered, if convenient, with a canvass. At the end of two hours the seed is spread out and allowed to dry as rapidly as possible, when it can be sacked ready for sowing. If this method is used, it must be remembered that oats will require more of the solution than wheat, in order to fully wet between and within the hulls.

By either form of treatment, immersion or sprinkling, the grains will be considerably swollen, and larger measure of seed must be sown per acre, if the sowing is done soon after treatment, as will usually be the case. If seed is kept long after treatment, care must be taken that it does not heat, otherwise no harm or disadvantage will result. Professor Bolley, from some preliminary trials, estimates that when sown soon after treatment it will be necessary to set the drill for $3\frac{1}{2}$ bushels of oats per acre, if the equivalent of $2\frac{1}{2}$ bushels of dry seed is desired, and with wheat it must be set for one bushel and eighteen quarts per acre, if desired to sow one bushel and four quarts. This will be some guide, but the farmer must, to a considerable extent, make his own estimates.

POTATOES.

The use of formalin for prevention of potato scab was first suggested by this Station in a newspaper bulletin issued February 26, 1897, and the full results of studies made in 1895-96, were presented in a bulletin (No. 65) issued in June, 1897. Some subsequent information was included in the annual report for 1897, distributed in April, 1898.

The remedy has been used by many individuals who have uniformly reported excellent, and usually entirely satisfactory results, and by a number of the experiment stations, also with approval. The treatment is easily applied and gives in all cases a far superior crop, and in soil free of germs is as complete a remedy as probably can be devised.

The method of treatment is to immerse the seed potatoes for two hours in a solution of the strength of one half pound of formalin to fifteen gallons of water. If the time is extended to three or four hours, there will be greater certainty of killing every germ of the disease, particularly in the deeply scabbed tubers, without materially endangering the growth of the potatoes. Potatoes not much sprouted have been left in a solution of the above strength for a number of days without the slightest injury. After treatment the tubers are cut and planted in the usual manner, either at once or after a time.

The same solution may be used five or six times in succession, if the

period for immersion is made a little longer each time to balance the gradual dilution of the solution, and particularly if the tubers are reasonably free from dirt.

The strength of the solution recommended for potatoes is based upon numerous trials, and may be considered about the best for use in all cases, but there is no need of attempting special accuracy, as the range for efficiency is quite wide. The solution for potatoes is twice as strong as can safely be employed for grain.

SUMMARY.

The use of formalin for smut in wheat and oats and for scab in potatoes is found by many trials to be one of the cheapest, simplest and most efficient remedies yet suggested. As formalin is practically non-poisonous, non-corrosive, and easy to obtain and handle, there seems little doubt of its coming into common use as a fungicide.

The diseases covered by this bulletin, with their remedies, are as follows:

CORN SMUT.

Gather and thoroughly destroy (burn) the smut balls during the growing season, and afterward. Treating the seed is of no use.

WHEAT, LOOSE SMUT.

No efficient remedy for farm practice can yet be recommended.

OAT SMUT AND STINKING SMUT OF WHEAT.

A simple and inexpensive treatment of the seed grain with formalin will entirely prevent the attack of these smuts.

Add $\frac{1}{2}$ pound of formalin to 30 gallons of water and immerse the seed grain for 2 hours, then spread out and dry.

Or, sprinkle the grain with the formalin solution until thoroughly wet, shoveling over rapidly to distribute the moisture evenly, then place in a pile (covered with sacking) for 2 hours, and finally spread out and dry as in the other method.

Grain swollen in this manner requires the drill to be set somewhat wider to permit the usual amount of seed to be sown per acre.

POTATO SCAB.

The formalin treatment of seed potatoes practically frees the crop from scab, with slight expense and trouble.

Add $\frac{1}{2}$ pound of formalin to 15 gallons of water and immerse the seed tubers for not less than 2 hours. If the potatoes are not much sprouted, a longer wetting is advantageous. After removing from the solution, cut and plant as usual.

In the use of formalin no special precautions are required.

THE SAN JOSE AND OTHER SCALE INSECTS, AND THE INDIANA NURSERY INSPECTION LAW.

JAMES TROOP, HORTICULTURIST AND STATE ENTOMOLOGIST.

The last General Assembly of Indiana passed a law providing for the inspection of nursery stock and to prevent the dissemination of the San Jose scale and other noxious insects, plant diseases, etc.

It will be seen by reading the full text of the law, which follows, that the main object sought to be accomplished was the stamping out, so far as possible, of the San Jose scale where it already occurs in the State, and the prevention of its further introduction on infested nursery stock, by requiring all nursery stock which shall be shipped into the State to be accompanied by a certificate of inspection signed by a State or Government Entomologist. This much is due not only to the local nurserymen, who have so much at stake, but to the fruit growers of the State, some of whom have already suffered the loss of their orchards through the introduction of scale-infested trees.

In order that nurserymen and fruit growers may become familiar with the provisions of the law, it is printed in full in the latter part of this bulletin. Brief descriptions and illustrations are also given of the San Jose scale and a few of the more common scale or bark-lice, which are frequently mistaken for the recently introduced species.

THE SAN JOSE SCALE (*Aspidiotus perniciosus*, COMSTOCK).

It has often been said that the greater portion of our most destructive insects have been imported, and this one is no exception to the rule. It is not definitely known where it came from, but it is supposed to have been introduced from Japan. In fact, Professor F. M. Webster, of Ohio, has recently succeeded in tracing it to that country. This is undoubtedly the most to be dreaded of all the scale insects on account of its small size, the rapidity with which it increases in numbers and the difficulty with which it may be eradicated when once it has become established. In looking for it, most people will pass it by unnoticed on account of its minute size and unattractive appearance. The shape of the female, which is wingless, is nearly circular in outline, while the male, which is provided

with wings, is more elongated. The female scale is sharply convex in the center. This last character will help to distinguish it from many of the more common species. Another distinguishing character is found in the reddish discoloration of the bark immediately surrounding and underneath the scale. This discoloration extends through both the outer and the inner bark.

It is found on nearly or quite all species of fruit trees, and numerous shade and forest trees as well. An Osage Orange hedge around an infested orchard makes an admirable breeding place for the insect, and



FIGURE 2. BRANCH INFESTED WITH THE SAN JOSE SCALE.

one from which it would be almost impossible to eradicate it except by fumigation or by fire.

It has been found in eleven counties in Indiana, viz:

Clark.	Elkhart.	Gibson.	Howard.
Jefferson.	Laporte.	Marion.	Miami.
Morgan.	Switzerland.	Washington.	

In every instance the infested trees have been traced back to nurseries which received their stock either directly or indirectly from California, hence it will be readily seen that it is of the utmost importance, if this and other noxious insects are to be held in check, that the provisions of the new inspection law be enforced not only by those who are appointed by law for that purpose, but by all those who are the most vitally interested in the subject—the nurserymen and fruit growers.

REMEDIES.

There are three principal remedies now in use for this and all other scale insects:

1. The Hydrocyanic acid-gas treatment or fumigation.
2. Spraying with certain solutions or washes.
3. Fire.

The latter is the most satisfactory after the trees have become thoroughly coated with the scales. I have known of two instances where a few trees in the orchards were evidently infested when the trees were

planted, and consequently were well coated when discovered. These trees were dug up and burned, and a careful inspection of the orchards a year after failed to reveal the presence of a single scale.

Fumigation is not generally practiced except by nurserymen or by inspectors who thoroughly understand the poisonous nature of the material used.

The most practical remedy for general purposes in the orchard where the trees have not become badly infested, is to spray with a strong solution of whale oil soap (two pounds to one gallon of water), or with strong kerosene emulsion while the trees are in a dormant condition.

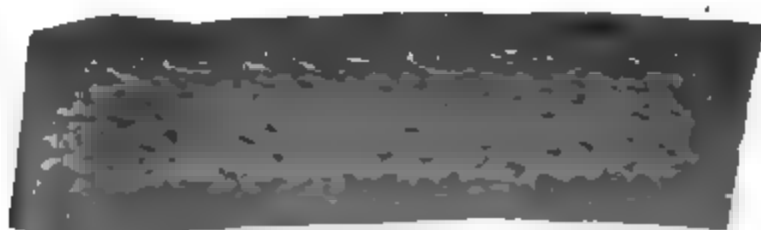


FIGURE 3. PIECE OF BARK INFESTED WITH THE OYSTER SHELL BARK-LOUSE.

THE OYSTER SHELL BARK-LOUSE (*Mytilaspis pomorum*, BOUCHÉ).

It is a very common form of bark-louse. It derives its name from the fact that the female scale resembles somewhat closely the oyster shell. (See figure 3.) It infests all kinds of fruit trees, shrubs and forest trees, and while it sometimes becomes numerous enough to seriously affect the vitality of the tree, yet I have never known of its killing a tree outright.

Kerosene emulsion or whale oil soap is recommended for this.

THE SCURFY BARK-LOUSE (*Chionaspis furfurus*, FITCH).

Is a native species, and judging from the number of specimens which have been sent to the Experiment Station for identification, it is by far the most widely distributed of all the scale insects.

As will be seen by the accompanying illustration (figure 4), the scale is large enough to be readily recognized by the naked eye. The female scale, shown enlarged on the right, is quite broad at one end and tapers towards the other, upon which is a little brownish colored scale. The male scale, shown enlarged on the left, is more elongated, apparently four-sided and much smaller than the female. The female is wingless and sel-

dom travels any great distance. Although this species is more or less common, it seldom becomes numerous enough to cause any great amount of injury.

The same remedies will apply as are recommended for the oyster shell bark-louse.

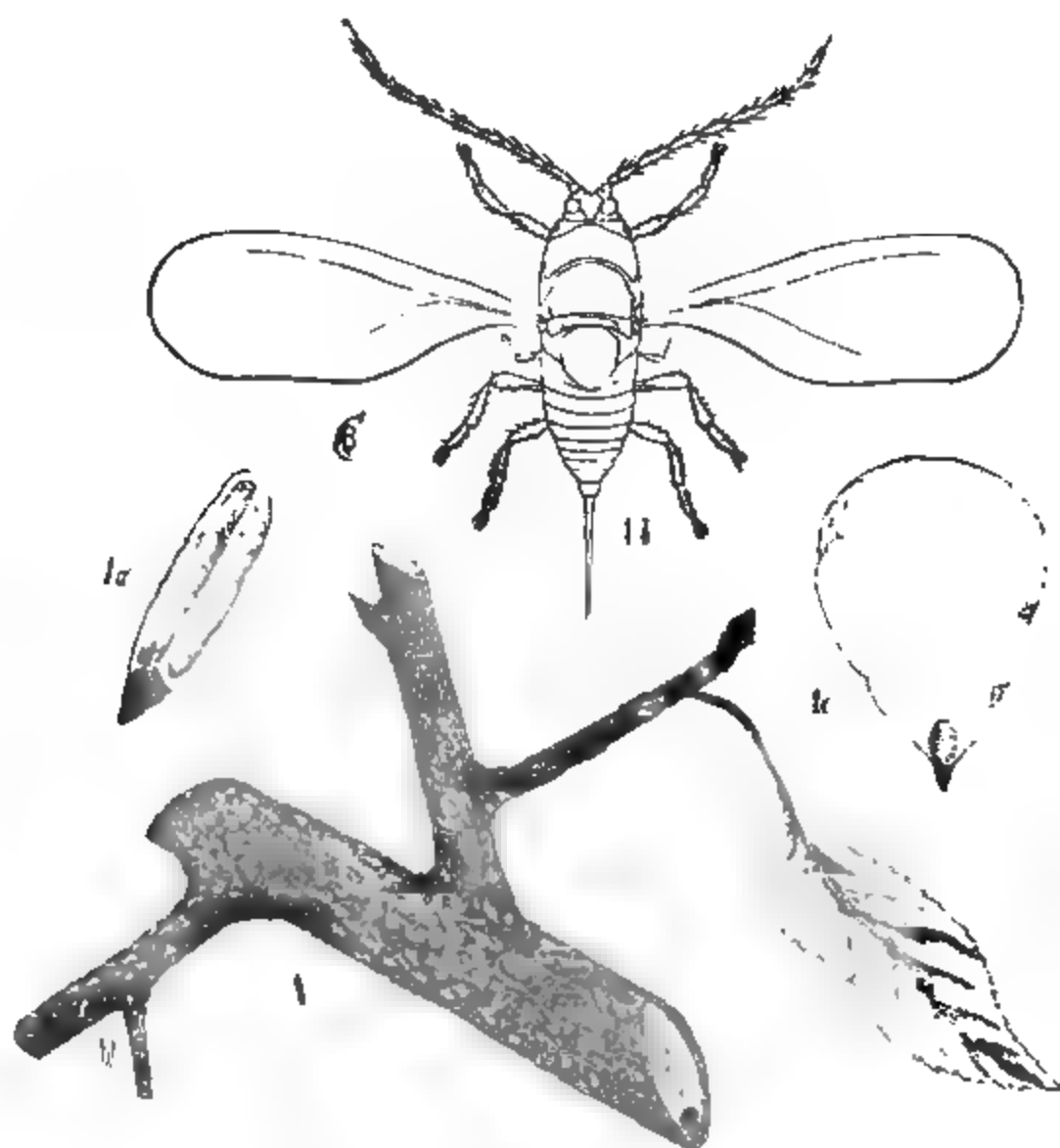


FIGURE 4. SHOWING THE SCURFY SCALE—1a, MALE SCALE; 1b, THE WINGED MALE INSECT; 1c, THE FEMALE SCALE, ALL ENLARGED. 1, AN INFESTED BRANCH, NATURAL SIZE.

THE PUTNAM SCALE (*Aspidiotus ancytus*, PUTNAM).

Belongs to the same genus and closely resembles the San Jose scale. It is a native of this country, however, and to this may be attributed the fact that it is not generally considered a very destructive species.

LAW FOR INSPECTION OF NURSERY STOCK.

Following is a full text of the law recently passed by the General Assembly:

CHAPTER CXXXVIII.

Acts 1899.

A bill for an act to provide for the inspection of nursery stock and to prevent the dissemination of the San Jose scale and other noxious insects and plant diseases, and for the appointment of a State Entomologist, defining his powers, prescribing his duties and fixing his compensation; also defining the crimes for the violation of this act, and prescribing the punishment therefor and making an appropriation for the same, and declaring an emergency.

[S. 12. Approved March 1, 1899.]

Section 1. Be it enacted by the General Assembly of the State of Indiana, That all nurseries in Indiana where trees, shrubs, vines, plants or other nursery stock are grown and offered for sale, and all propagating gardens and sale stations of the above named articles shall be inspected by the State Entomologist at least once a year, not earlier than June 1, nor later than October 1, at such times as he may elect; and he shall notify, in writing, the owners of such nurseries, the Secretary of the State Board of Agriculture, the Director of the State Agricultural Experiment Station and the President of the State Horticultural Society, of the presence of any San Jose scale or other destructively injurious insects or fungi on trees, shrubs, vines, plants or other stock of such nurseries; and shall notify in writing the owner of any affected stock that he is required on or before a certain day to take such measures for the destruction of such insects or fungus enemies of nursery stock as have been shown to be effectual for this purpose.

Sec. 2. For the purpose of carrying this act into effect the Governor is hereby authorized to appoint a State Entomologist, who shall hold office for four years unless sooner removed by the Governor for cause, whose duty it shall be to inspect nursery stock and other plants as provided for in this act; and the said State Entomologist, or his assistants, are hereby empowered with authority to enter upon any premises and examine all plants whatsoever in the discharge of the duties herein prescribed.

Sec. 3. Any person or persons who shall obstruct or hinder said State Entomologist, or his assistants, in the discharge of their duties shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined not less than ten dollars (\$10) or more than twenty-five dollars (\$25).

Sec. 4 The State Entomologist shall receive for his services the

sum of two and one-half (\$2.50) per day for the time actually required in the performance of his duties as said State Entomologist, together with his traveling expenses, both of which shall be paid as hereinafter provided.

Sec. 5. The owner of any affected nursery stock shall, within the time specified, take such steps for the destruction of San Jose scale or other destructively injurious insects or fungus enemies present as will exterminate the same, and it shall be a misdemeanor to ship or deliver any such stock, punishable by a fine of twenty-five dollars (\$25) for every such offense, the fine recoverable before a justice of the peace or by indictment of the grand jury of the county in which the nursery is situated, or of that to which such stock may have been shipped.

Sec. 6. Whenever a nurseryman or seller of trees, shrubs, vines, plants or other nursery stock, who is a resident of this State, shall ship or deliver any such goods, he shall send on each package so shipped or delivered a written or printed certificate stating that such stock has been examined by a State or Government Entomologist and found, to the best of his knowledge and belief, to be free from San Jose scale or other destructively injurious insects or fungus enemies. Failure to furnish such certificates, or furnishing a false certificate, shall render him liable to the penalty of a fine of twenty-five dollars (\$25) for each and every shipment or delivery without such certificate.

Sec. 7. When the State Entomologist, or his assistant, examines any trees, shrubs, vines, plants or other nursery stock in this State, under the provisions of this act, and finds such nursery stock apparently free from San Jose scale and other destructively injurious insects or fungus enemies, he is hereby authorized and directed to make out and deliver, in writing, to the owner of such stock a certificate stating that he has inspected such stock and found the same to be apparently free from San Jose scale and other destructively injurious insects and fungus enemies, and he shall file similar certificates with the Secretary of the State Board of Agriculture, the President of the State Horticultural Society and the Director of the State Agricultural Experiment Station, which certificates shall at all times be subject to public inspection.

Sec. 8. Whenever a nurseryman, fruit grower or agriculturist in this State shall know or have good reason to believe that his trees, shrubs, vines or plants are affected with San Jose scale, yellows, rosette or other destructive insect or fungus enemies, he shall have the privilege and it shall be his duty to notify the State Entomologist, who shall proceed in person, or by his assistants, to examine the same without delay, and advise the proper remedies for the destruction of such insects or fungus enemies that may be present. In case the owner or owners, or person in control of said affected trees, shrubs, vines or other plants do not apply the proper remedies recommended by the said State Entomologist within a certain specified time, said owner or owners, or person in control of, shall

be liable to a fine of not more than twenty-five dollars (\$25) nor less than ten dollars (\$10) and costs, in the judgment of the court for every such offense, the fine to be recoverable in the same manner as that provided for in section 5 of this act: Provided, That in case of objection to the findings of the State Entomologist, an appeal may be taken to the circuit court, whose decision shall be final; said appeal must be taken within three (3) days and shall operate as a stay of proceedings until it is heard and decided.

Sec. 9. Every package of trees, vines, plants or other nursery stock shipped into this State from another State shall be plainly labeled on the outside with the name of the consignor, the name of the consignee and a certificate signed by a State or Government Inspector, showing that the contents have been examined by him, and that to the best of his knowledge and belief such stock is free from San Jose scale or other destructive insect or fungus enemies.

Sec. 10. Whenever any trees, shrubs, vines or other plants are shipped into the State without such certificate plainly fixed on the outside of the package, box or car containing same, the fact must be reported within twenty-four hours to the State Entomologist by the agent of the railway, express or steamboat company, or other person or persons carrying or receiving the same, and any agent of any railway, express or steamboat company or mail carrier, or any other person or persons who shall violate the provisions of this section shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined in any sum not less than twenty-five dollars (\$25) nor more than one hundred dollars (\$100) and costs, or imprisonment in the county jail not less than five (5) days nor more than thirty (30) days, or may be so fined and imprisoned in the discretion of the court; and any such fines collected under the provisions of this act shall be paid over to the State Treasurer. On notification of the receipt of such uncertified package or packages of trees, shrubs, vines or other plants, the State Entomologist shall examine, or cause to be examined, said package or packages at the expense of the railway, express, steamboat companies or other person or persons carrying the same, and if found to be free from all injurious insects and plant diseases he may allow them to pass to their destination, otherwise he shall cause the same to be burned and destroyed. But in no case shall the railway or other transportation company allow said package or packages to pass out of his possession under penalty, until the same has been duly inspected by the State Entomologist or his agent.

Sec. 11. The sum of one thousand dollars (\$1,000) annually, or so much thereof as may be necessary, is hereby appropriated out of any moneys in the State treasury not otherwise appropriated for the purpose of paying the per diem and expenses of the State Entomologist and his assistant in the performance of their duties under the provisions of this act, and the Auditor of State is hereby directed to honor requisitions

made by the said State Entomologist for said per diem and expenses incurred in the performance of his duties, and the State Entomologist shall make an annual report to the Governor of the amount expended.

Sec. 12. Inasmuch as the insect known as the San Jose scale has appeared in some sections of the State, an emergency is declared to exist, and this act shall take effect from and after its passage and approval by the Governor.

ROOTS AS FOOD FOR PIGS.

C. S. PLUMB AND H. E. VAN NORMAN.

All farm animals relish succulent foods, and different forms of vegetable roots have long been fed more or less to sheep and cattle as desirable additions to dry winter rations. Pigs, however, in winter have usually had to be content with grain or mill feed and water, or, perhaps, skim milk. Succulent food has not been thought of for them, excepting in a few cases. Some experiments on the suitability of silage as pig feed have been conducted, but with most unsatisfactory returns. It was not found to be a desirable pig food. Roots, however, offer a more appetizing substance for pigs, and here and there is found a farmer who has fed sugar beets or artichokes to swine with results that have called forth his approval.

Mangel wurzels furnish the farmer with a large amount of succulent winter food in the form of roots. Very great yields have been reported by various cultivators, wherein it has been shown that the cost per ton for production is comparatively light. In 1898, at this Station, as high as 25¼ tons of mangels were produced per acre, at a cost of only 85 cents per ton harvested.

In the use of this crop, its adaptability and value as a pig food was given a trial, which is herewith reported upon.

The pigs used were twelve Chester Whites, weaned only two days before the commencement of the experiment, being at this time about three months of age. These pigs were composed of two litters, seven of pure bred Chester White, and five the result of crossing a Chester White boar on a Poland-China sow. These pigs were divided into two lots, as nearly equal, all things considered, as could be, there being six individuals in each lot. The sex and breeding of each lot is as follows. There were three of each sex in each lot.

Lot I.

No. 222.	Male.	Pure Chester White.
" 224.	Female.	" " "
" 225.	"	" " "
" 226.	Male.	Cross bred.
" 227.	Female.	"
" 230.	Male.	"

Lot II.

No. 218.	Male.	Pure Chester White.
" 220.	Female.	" " "
" 221.	Male.	" " "
" 223.	Female.	" " "
" 228.	"	Cross bred.
" 229.	Male.	"

The Chester White blood was much the most prominent in the cross-bred animals, so far as the observer could see, and the black color of the Poland-China was inconspicuous.

The pigs were confined in small lots about 15x30 feet in size, with a comfortable small shelter house in each lot.

The pigs were fed at regular intervals, lot I receiving a slop mixture of one part pure corn meal, two parts shorts, and such cut up mangels as they would eat, while lot II received corn meal and shorts only, in the same proportions. No drink but water was given. Ashes and salt were always accessible in each pen. The pigs were fed about 7:00 a. m. and 5:30 p. m. Feeding periods extended over seven days each, and each pig was weighed at the end of each period. The feeding of roots extended from February 1, 1899, to April 19, and the following table gives the weights of the individual pigs, the total weight and the average weight of the six pigs in each lot for each period, and the total gain and average gain for each pig and each lot for the trial:

WEIGHTS OF PIGS IN POUNDS WHILE FEEDING ROOTS.

DATE, 1899.	LOT I (FED MANGELS).							LOT II (NO MANGELS).							
	No. 222.	No. 224.	No. 225.	No. 226.	No. 227.	No. 230.	Aver- age weight.	No. 218.	No. 220.	No. 221.	No. 223.	No. 228.	No. 229.	Total weight.	Aver- age weight.
Feb. 1 .	46	50	42	51	28.5	47	264.5	52	51.5	45.5	50	40	38	277	46.1
Feb. 8 .	48	51.5	44	54.5	29	49.5	276.5	56	57	50.5	53	44	40	300.5	50
Feb. 15 .	55	57	49	62	34	53	310	63.5	66	57.5	59	48	45.5	339.5	56.5
Feb. 22 .	60	61	55	65	35.5	57	338.5	69	71	63	64	50.5	47.5	365	60.8
Mar. 1 .	65	68	59	74	41	63	370	76.5	80.5	70	70	56	55	408	68
Mar. 8 .	70.5	72.5	64	80	43.5	67.5	398	81	85	73.5	75	60.5	58	433	72.1
Mar. 15 .	74	78	68	85.5	48.5	73.5	427.5	90.5	94	80	81.5	67	65	478	79.6
Mar. 22 .	80	84	73.5	93.5	51	77	459	98	104	90	90	72	68	522	87
Mar. 29 .	81.5	87	78.5	98	54	81.5	480.5	103	112	97	95.5	74.5	72.5	554.5	92.4
Apr. 5 .	88	92.5	81.5	105	60	87	514	109.5	120	105	101	78.5	78.5	592.5	98.7
Apr. 12 .	97	99	89	115	69	96.5	564.5	120	128	116	115	87.5	88	654.5	109
Apr. 19 .	106.5	111	100	129	72.5	101	620	130	143	125	125	100	96.5	719.5	119.9
Total gain	60.5	61	58	78	44	54	355.5	78	91.5	79.5	75	60	58.5	442.5	. . . .
Average daily gain	0.78	0.79	0.75	1.00	0.57	0.70	4.61	1.0	1.18	1.03	0.97	0.77	0.76	5.74	. . . .

An examination of this table shows that each pig constantly gained from week to week, but that the lot fed mangels gained but 355½ pounds to 442½ pounds gained by lot II, or 87 pounds less. Pig No. 227 of lot I was the smallest of the twelve, and made the most unsatisfactory gain, but this was not due to sickness, as the general health of the animals was excellent.

The amount of food for each lot is given in the following table:

FOOD FED IN WEEKLY PERIODS WHILE FEEDING ROOTS.

11 PERIODS, 1899.	Lot I.			Lot II.	
	Corn Meal.	Shorts.	Mangels.	Corn Meal.	Shorts.
Feb. 1- 8 . .	25 lbs., 0 ozs.	50 lbs., 0 ozs.	43 lbs., 8 ozs.	32 lbs., 8 ozs.	64 lbs., 0 ozs.
Feb. 8-15 . .	29 lbs., 0 ozs.	58 lbs., 0 ozs.	42 lbs., 0 ozs.	36 lbs., 0 ozs.	72 lbs., 0 ozs.
Feb. 15-22 . .	35 lbs., 8 ozs.	71 lbs., 0 ozs.	36 lbs., 0 ozs.	43 lbs., 0 ozs.	86 lbs., 0 ozs.
Feb. 22-Mar. 1	38 lbs., 12 ozs.	77 lbs., 8 ozs.	31 lbs., 0 ozs.	49 lbs., 4 ozs.	97 lbs., 8 ozs.
Mar. 1- 8 . .	40 lbs., 0 ozs.	80 lbs., 0 ozs.	42 lbs., 0 ozs.	49 lbs., 0 ozs.	98 lbs., 0 ozs.
Mar. 8-15 . .	40 lbs., 0 ozs.	80 lbs., 0 ozs.	53 lbs., 0 ozs.	51 lbs., 12 ozs.	103 lbs., 8 ozs.
Mar. 15-22 . .	42 lbs., 0 ozs.	84 lbs., 0 ozs.	56 lbs., 0 ozs.	52 lbs., 8 ozs.	105 lbs., 0 ozs.
Mar. 22-29 . .	42 lbs., 0 ozs.	84 lbs., 0 ozs.	46 lbs., 8 ozs.	52 lbs., 8 ozs.	104 lbs., 8 ozs.
Mar. 29-Apr. 5	43 lbs., 0 ozs.	86 lbs., 0 ozs.	56 lbs., 0 ozs.	53 lbs., 8 ozs.	107 lbs., 0 ozs.
Apr. 5-12 . .	48 lbs., 0 ozs.	96 lbs., 0 ozs.	56 lbs., 0 ozs.	62 lbs., 0 ozs.	123 lbs., 8 ozs.
Apr. 12-19 . .	59 lbs., 8 ozs.	111 lbs., 0 ozs.	52 lbs., 0 ozs.	69 lbs., 12 ozs.	131 lbs., 0 ozs.
Totals . . .	442 lbs., 12 ozs.	877 lbs., 8 ozs.	514 lbs., 0 ozs.	551 lbs., 12 ozs.	1,091 lbs., 0 ozs.

This table shows that lot I ate 442¾ pounds of corn meal, and lot II 551¾ pounds, or lot I 109 pounds less than lot II, and that lot I ate 877½ pounds of shorts, and lot II 1,091 pounds, or lot II 213½ pounds the most. Lot I, however, ate 514 pounds of mangels, that lot II did not receive. The mangels were fed only as eaten up clean, and the pigs did not eat them with the relish that might have been anticipated. The cut roots were mixed with the grain slop, and the pigs would clean up the slop in preference to the roots as a general rule, eating the latter quite leisurely.

The market value of the foods fed, the amount eaten and the gains in weight by each lot are the important factors in the results of the feeding.

The figures relating to values, are based on the cost of the milling products in Lafayette, and the estimated value of the roots for general feeding as frequently given by agricultural writers.

Lot I was fed:

442¾ pounds corn meal, at 80 cents 100 pounds.....	\$3 54
877½ pounds shorts, at 70 cents 100 pounds.....	6 14
514 pounds mangels, at 10 cents 100 pounds.....	51

Total value food eaten by lot I.....\$10 19

Lot II was fed:

551¾ pounds corn meal, at 80 cents 100 pounds.....\$4 41
1,001 pounds shorts, at 70 cents 100 pounds..... 7 64

Total value of food eaten by lot II.....\$12 05

The above records show a difference in value of foods fed of \$1.86 in favor of lot I, fed mangels.

If we now compare the cost of food with cost of gain we get the following results:

	Lot I.	Lot II.
Cost of food fed	\$10 19	\$12 05
Total pounds gain made	355.5	442.5
Average daily gain made in pounds	4.6	5.7
Pounds of meal and shorts to make pounds gain	3.71	3.7
Cost of food for each pound of gain	2.8 cents.	2.7 cents.
Cost of food for each 100 pounds of gain . .	\$2 80	\$2 70

The interesting facts are brought out by these figures, that it required exactly the same amount of corn meal and shorts to make a pound of gain with each lot, and that the total cost of all food for each pound of gain for lot I was slightly in excess of the cost for lot II, the roots making this extra expense, which amounted to 10 cents for each 100 pounds of gain live weight.

The amounts of digestible food consumed is an important feature of this experiment. This is shown in the following table:

DIGESTIBLE FOOD IN POUNDS CONSUMED BY PIGS.

	Lot I.				Lot II.			
	Dry Matter.	Pro-tein.	Carbo-hydr's.	Fat.	Dry Matter.	Pro-tein.	Carbo-hydr's.	Fat.
442¾ lbs. corn meal	376.34	31.03	288 67	14.39	.....	.....	.....	.....
877½ lbs. shorts	773.95	107.23	438.57	33.51	.....	.....	.....	.....
514 lbs. mangels	47.77	5.29	29 00	.57	.....	.....	.....	.....
551¾ lbs. corn meal . . . . .	.....	.....	.....	.....	468.99	38.68	359.74	17.93
1091 lbs. shorts . . . . .	.....	.....	.....	.....	962.26	133.32	545.28	41.89
Totals	1,198.06	143.55	766.24	48.57	1,431.25	175.00	905.02	59.82

This table shows that lot II, which made the largest gain in live weight, ate 233.19 pounds more dry matter, 28.45 pounds more digestible protein, 148.78 pounds more digestible carbohydrates and 11.25 pounds more digestible fat than did lot I.

If we compare the relative amounts of dry matter required to make a pound of gain with each lot, we find that—

Lot I was fed 3.36 pounds dry matter for each pound of gain.

Lot II was fed 3.23 pounds dry matter for each pound of gain.

Up to the end of the feeding of the mangels, the evidence in cost of gain is in favor of the pigs in lot II, which received no such food.

In feeding pigs succulent food, the opinion has been advanced that especially good results have been noted in its after effects, when the pigs may be receiving only dry grain. Some breeders have thought that sows fed artichokes or other roots, have proved more vigorous and growthy, with better milking capacity, than those not so fed. Some observations at this station have also pointed in the direction of a favorable

AFTER INFLUENCE OF FEEDING SUCCULENT FOOD TO PIGS.

In order to ascertain if such an after influence existed, these two lots of pigs were fed exactly alike, after the mangel feeding ceased, from April 19 to June 7, a total of seven weeks or forty-nine days.

The following table gives the growth of the individual pigs, total weight of each lot, total gain of each individual and lot, and average weight and gain from week to week.

WEIGHTS OF PIGS IN POUNDS AFTER FEEDING HOOTS.

DATE, 1899.	RED MANORCH BEFORE APRIL 19.							LOT II, NEVER RED MANORCH.						
	No. 222.	No. 224.	No. 225.	No. 226.	No. 227.	No. 230.	Total Weight.	No. 218.	No. 220.	No. 221.	No. 223.	No. 228.	No. 229.	Total Weight.
April 10 ..	119	120	106.5	142	80.5	112	680	139	162.5	136.5	136.5	107	108.5	775
May 3 ..	131	133	117.5	137	89	124	751.5	152.5	161.5	149	150	116	116	845
May 10 ..	145	144.5	132	173	94.5	136.5	829.5	167.5	177	162.5	154	133	130	924
May 17 ..	156	156.5	137	189	108	148.5	805	181.5	190	172	175	139	141	999.5
May 24 ..	168	167	146	203	117	161	964	190	195	184	181	150	150	1,053
May 31 ..	175	180	161.5	213	137	167	1,023.5	200.5	211	200	190	163	160	1,124
June 7 ..	190	183	168.5	231	139	180	1,091.5	216	223	207	205	172	172	1,194
Total gain	71	63	62	89	58.5	68	411.5	77	69.5	70.5	68.5	65	68.5	419
Ave. gain.	1.44	1.26	1.25	1.81	1.19	1.37	8.39	1.57	1.41	1.43	1.41	1.32	1.39	8.55

From an examination of this table we can see that lot II still maintained the lead in live weight gain, although to a less extent than in the root-feeding period, as on June 7 there was a difference in total gain of only $7\frac{1}{2}$ pounds in favor of lot II, although at the end of the root-feeding period the difference was 87 pounds in favor of lot II.

The total weekly gains made by each lot for these seven weeks is clearly shown in the following figures:

<i>Gains Per Week.</i>	<i>Lot I.</i>	<i>Lot II.</i>
Week ending April 26.....	.60 pounds.	$55\frac{1}{2}$ pounds.
Week ending May 3.....	$.71\frac{1}{2}$ pounds.	70 pounds.
Week ending May 10.....	.78 pounds.	79 pounds.
Week ending May 17.....	.65 pounds.	75 pounds.
Week ending May 24.....	.69 pounds.	$53\frac{1}{2}$ pounds.
Week ending May 31.....	$.64\frac{1}{2}$ pounds.	71 pounds.
Week ending June 7.....	.63 pounds.	70 pounds.
<hr/>		<hr/>
Average weekly gains.....	.67.3 pounds.	67.7 pounds.

This shows lot I to have made average weekly gains nearly as great as lot II, the difference being hardly half a pound.

The amount of food eaten by the two lots, as a matter of interest is given in the following table. In this stage of the experiment equal weights of corn meal and shorts were fed each lot.

FOODS FED IN WEEKLY PERIODS AFTER FEEDING ROOTS.

SEVEN PERIODS—1899.	Lot I.			Lot II.		
	Corn Meal.		Total Grain.	Corn Meal.		Total Grain.
		Shorts.			Shorts.	
April 19-26.	115 lbs., 8 ozs.	115 lbs., 8 ozs.	231 lbs., 0 ozs.	115 lbs., 8 ozs.	115 lbs., 8 ozs.	231 lbs., 8 ozs.
April 26 to May 3	119 " 0 "	119 " 0 "	238 " 0 "	119 " 0 "	119 " 0 "	238 " 0 "
May 3-10.	129 " 0 "	129 " 0 "	258 " 0 "	129 " 0 "	129 " 0 "	258 " 0 "
May 10-17	131 " 8 "	131 " 8 "	263 " 0 "	131 " 8 "	131 " 8 "	263 " 0 "
May 17-24	139 " 8 "	139 " 8 "	279 " 0 "	139 " 8 "	139 " 8 "	279 " 0 "
May 24-31	140 " 0 "	140 " 0 "	280 " 0 "	140 " 0 "	140 " 0 "	280 " 0 "
May 31 to June 7.	140 " 0 "	140 " 0 "	280 " 0 "	140 " 0 "	140 " 0 "	280 " 0 "
Total.	914 lbs., 8 ozs.	914 lbs., 8 ozs.	1829 lbs., 0 ozs.	914 lbs., 8 ozs.	914 lbs., 8 ozs.	1829 lbs., 8 ozs.

The results of the seven weeks feeding are shown in the following comparison:

	<i>Lot I.</i>	<i>Lot II.</i>
Cost of food fed	\$13 72	\$13 72
Pounds of gain made per lot	411.5	419
Average gain per lot per day, in pounds	8.4	8.5
Pounds of meal and shorts to make one pound gain	4.44	4.36
Cost of food for each pound of gain	\$0 02.99	\$0 02.98
Cost of food for 100 pounds of gain	2 99	2 98

This difference is too slight for consideration, and we can see that so far as the figures show after feeding roots, that the two lots gave essentially equal returns in gains of live weight, and in cost of production. Lot I, however, did make a more satisfactory growth at this time than while being fed roots, but so also did Lot II. Undoubtedly the favorable weather conditions of this period were to the advantage of each lot.

In conclusion, if the mangels were of value in the feeding, the figures show it in only a small way. The mangel-fed pigs were no more healthy at any time during the 126 days, than were those not so fed, while it has been shown that the cost of producing flesh with them was slightly more than with the others. The difference, however, was so slight that a redistribution of the pigs or a substitution of another in lot I might have reversed the results. Had pig No. 227 been transferred to lot II, and one of the smaller ones of lot II placed with lot I, perhaps lot II would have made the smaller gain.

The writers do, however, feel that roots in some form are a desirable food for pigs in winter as an addition to the grain ration in promoting healthful activity of the digestive organs and acting as an appetizer. Sugar beets, artichokes or carrots would no doubt serve this purpose better than mangels. They are more expensive in view of greater cost of production, but this difference is not important. They, however, contain enough more sugar to make them somewhat more relished by the pigs than are the mangels.

SHEEP SCAB.

A. W. BITTING, D. V. M.

Sheep scab is a contagious disease of sheep caused by a small animal parasite. The parasite passes its life entirely upon the body of the sheep unless accidentally removed, in which event it can not reproduce and soon dies. The parasite has such feeble powers of locomotion that the disease can only be communicated from one animal to another by coming in close contact, or by coming in contact with the pens, yards, feed racks, shipping cars, etc., where diseased sheep have lost bits of wool and skin bearing these parasites. The disease can not be borne by wind or water, as in many infectious diseases. It therefore follows that it is a controllable disease, and that by proper methods it is possible to stamp it out.

DESCRIPTION.

The parasite which causes this disease is known as sheep scab (*Psoroptes communis*). Horses, cattle, sheep, goats and rabbits are affected with scab, but each has a variety peculiar to itself. The sheep scab will not cause scab in other species of animals, and vice versa, the scab parasite of other animals will not cause the disease in sheep. There are also different varieties of scab parasites for different parts of the body. For example, there are four varieties affecting sheep. The body scab affects the back, sides, rump and shoulders, and is the common form. A second variety affects the face and muzzle, causing black muzzle. A third attacks the joints and the scrotum. The fourth variety affects the eyelids. The first variety is the only one that gives us much concern, and I do not recall having ever seen either of the other varieties.

The scab mite is oval in shape with a convex back and is flat beneath. It has eight legs, which are short and fairly stout. The last pair is quite small. The head is pointed and closely set on the body. The parasites are large enough to be distinguished by the naked eye when under favorable conditions. One may see them crawl from broken skin crusts upon a black surface in strong sunlight. The females are larger than the males being about one-fortieth of an inch long and one-sixtieth broad, while the males are about one-sixtieth of an inch long and one-eightieth of an inch broad. The scab parasites live upon the body and get their food by biting the skin. The bite causes irritation, itching and an exudation of

serum, which dries and forms a crust or scab. The parasites live under these scabs and gradually extend the area by biting the healthy skin at the edge. Wherever these scabs form, the wool loosens and drops out in small locks, then in larger tags, and finally leaves the part bare.

The scab parasite has phenomenal reproductive power, for each female in fifteen days is believed to produce on an average of fifteen eggs, which result in five males and ten females. At this rate at the end of ninety days, one pair would produce 1,500,000 offspring.

The length of time which the scab parasite lives is not positively known, but it is supposed to be about fifteen days. The female lays from fifteen to twenty eggs on the skin, or attaches them to the wool, and the old pair die. The eggs hatch in three or four days into a six-legged mite; after three or four days the six-legged mite moults and becomes eight-legged, and in about one week it will have paired, moulted, laid eggs and died.

While the period of incubation of the eggs seems to be from two to four days on the body of the sheep, it is believed that the period may be greatly prolonged when the scabs are removed, and that it is owing to this fact that sheep scab may remain in pens for several weeks after diseased sheep have been removed.

The effect of the scab upon the sheep is to cause irritation as a result of the bite, which in turn induces biting or pulling the wool and rubbing, and in a short time the fleece appears very ragged. The heavier the fleece and warmer the stable, the worse is the disease. Where all the wool comes off, the skin is left thin and cracks and bleeds easily. General emaciation follows, and if the sheep are not cared for they will die. The length of time which they will withstand an attack will depend upon the condition of the sheep when first infected, the season of the year and the amount and character of the food received. The disease does not tend to self recovery.

The contagion is spread from one animal to another with great certainty. If the sheep are close woolled and in good condition, it does not make rapid headway, but if the sheep are loose woolled and thin, it soon goes through the entire flock. In close quarters a whole flock may show the malady in from two to three weeks after the infection has been introduced. The length of time which should be allowed to elapse between the removal of an infected flock from a pen until it is safe to return healthy sheep to the same quarters, is not settled. Some cases have occurred in which it seemed that the infection remained for some months. Under ordinary exposure to weather and prompt removal of all stock, six weeks have been found to be sufficient. As a matter of safety, all the woodwork in inside pens should be thoroughly sprayed with the same dip as used upon sheep.

PREVENTION.

The treatment of sheep scab should have two objects—prevention and cure. Prevention should be the aim in all cases. It is cheaper to prevent the disease than it is to cure it. When sheep are purchased from any flock in which there is a history of the disease, they should be kept in quarantine until there is absolute certainty that no disease exists, before admitting them to the flock. In purchasing breeding stock, the purchase should be made sufficiently early so that a quarantine may be kept up for at least two weeks. All sheep purchased at a distance and passing through stock yards should be dipped after they have arrived, although they may have been dipped in the yards. The single dipping is not sufficient, and a second dipping, ten days later, will complete the work. Keeping out all scabby sheep and quarantining those with a doubtful history, or having come in contact with places where scabby sheep have been, are the principal points in prevention.

The treatment for the cure of the disease consists in dipping the sheep in baths containing materials which will kill the parasites and their eggs. Owing to the fact that many of the parasites and eggs are well covered with the scab or crust that serves as an excellent protection, it is necessary that the bath be sufficiently prolonged to reach all parts under the crust, and that the bath be repeated in about ten days, in order to insure the death of any of the parasites or eggs that may have escaped the effects of the first dipping. The best dip is that which will accomplish this end with the least injury to the sheep or fleece, and to the operator.

SCAB REMEDIES OR "DIPS."

All dips have some objectionable features, and it is a question of selecting the least objectionable. The lime and sulphur dips are effective but have an injurious effect upon the wool and are hard upon the sheep. They may therefore be used with least injury after shearing or while the fleece is very short. The injury is also minimized by preparing the dip with the minimum amount of lime and thoroughly straining before using. The arsenical dips are effective, but often cause the sheep to sicken and sometimes causes loss due to ignorance and carelessness in handling. The sheep must always be kept in bare lot or pen after dipping until quite dry, otherwise the dipping will fall upon the pasture or other material that may be eaten and thus cause poisoning. The tobacco dips cause some sickening of the sheep and are disagreeable to the operator, but on the whole are preferable to either of the others. The carbolic acid dips are attended by too many failures to be safely recommended. They are excellent for ticks, but not a success in scab.

The lime and sulphur dips have been recommended by the Department of Agriculture, but the criticism for so doing has been very strong. The lime and sulphur dip is made with eight pounds of unslacked lime and

twenty-four pounds of sulphur to 100 gallons of water. These are boiled together for a couple of hours and then allowed to stand for a day and then strained before using.

A tobacco dip may be made by taking from twenty to twenty-four pounds of tobacco, and soaking in sufficient water to cover for a day; boil for an hour and draw off, after from six to ten hours. Dilute to 100 gallons. The effectiveness may be increased by adding twenty pounds of sulphur.

An arsenic dip may be made as follows: Arsenic, one part; alum, twelve parts, and water 200 parts. Boil the arsenic and alum in ten gallons of water and dilute.

Another formula is arsenic, two pounds; sulphur, four pounds; carbonate of soda, two pounds. Boil in five gallons of water and dilute with 100 gallons. In all arsenical dips the sheep must not be allowed to drain upon the grass or anything that they will eat, otherwise poisoning may follow.

The objections to the home-made dips are that the ordinary farm is not provided with the appliances for doing the work, that it requires more care to do the work properly than is ordinarily given and that the time required, added to the cost of materials, makes the cost equal or greater than ready prepared dips. This is especially true when small flocks are to be dipped. Even the government inspectors use prepared dips for dipping at stock yards. None of the correspondents in reply to my query had used home-made dips, and the tobacco dips were most satisfactory.

All dips should be used at from 90 to 100 degrees F., and the thermometer should be used to determine the temperature. For scab the dipping should be continued from two to three minutes, but for ticks there is no advantage in keeping them in the water a moment after they have been submerged.

The commercial dips are usually put up in convenient packages, are ready for use and require little work other than the mixing at time of dipping. The most objectionable feature is the fact that they are not guaranteed to be of any definite composition, and are constantly subject to change. During the past three years an agent of a dip in this State has admitted that his dip has been changed each year, and each time the firm has claimed it to be a perfect dip for scab. It is the uncertainty of the quality and of the effectiveness of some dips that places a discount on most commercial preparations.

THE DIPPING TANK.

The dipping of sheep for ticks or scab is not easily accomplished unless preparation is made for the same. A box deep enough to submerge the sheep should be provided. If the dipping is for ticks, it is admissible

to turn the sheep on the side or back in immersing, but for scab this can not be done without some danger, as the time required for immersion needs to be from two to three minutes. In order that the loss should be small the sheep should maintain the natural position. If a small number of sheep are to be dipped, two men may lift the sheep into the vat and out again, but if a large number are to be dipped, this becomes a very tiresome operation. A tank can be made or purchased which will save its cost in a very short time. The tank should be four and a half feet deep, two feet wide at the top, six inches wide at the bottom and straight up and down at one end and slanting at the other, so that the bottom will be about four feet and the top eight feet in length. Cleats should be placed on the incline. Such a tank can be partly placed in the ground and the sheep conducted up to one end through a passage way and put into the tank by one person. After they have been in the bath for a sufficient length of time they will get out themselves. A dipping pen may be made out of a wagon bed, set at the end of the tank and inclined so as to return the drip. If the wagon floor is not water proof it may be made so with little expense with oil cloth or linoleum. Such a tank will require less dip than one of the same width from top to bottom, and the incline will enable the sheep to do the hardest part of the job, lift themselves out of the vat. The draining on the floor lessens the amount of dip lost on the ground. More elaborate tanks and pens may be made, but they are not necessary, unless a very large number of sheep are to be treated.

THE STATUS OF SHEEP IN INDIANA.

Sheep scab does not cause the great losses in this State that is credited to hog cholera, but is of such importance that more stringent measures for its control are demanded. These demands led to the passing of resolutions at the Indiana Sheep and Wool Growers' meeting two years ago, and an attempt to secure more rigid legislation upon the matter at the last session of the legislature. This effort failed.

In order to determine to what extent the disease is present in the State, the State Statistician was requested to insert a query upon his regular assessors' blanks as to the number of scabby sheep. The number of blanks returned showed 320 places at which scab was present, and that 9,338 sheep were affected. The following table is compiled on the basis of assessors' reports :

**ASSESSORS' REPORT OF SO-CALLED SCAB IN INDIANA
COUNTIES IN 1899.**

<i>County.</i>	<i>Reports.</i>	<i>Number of Sheep Affected.</i>
Adams	3	169
Allen	3	11
Bartholomew	2	5
Benton	0	0
Blackford	0	0
Boone	5	204
Brown	0	0
Carroll	5	27
Cass	5	18
Clarke	2	4
Clay	5	21
Clinton	5	188
Crawford	2	14
Daviess	2	12
Dearborn	0	0
Decatur	2	35
Dekalb	3	18
Delaware	3	409
Dubois	6	39
Elkhart	6	121
Fayette	3	248
Floyd	1	3
Fountain	7	149
Franklin	8	361
Fulton	3	159
Gibson	5	35
Grant	8	404
Greene	2	4
Harrison	4	18
Hancock	5	372
Hamilton	6	595
Hendricks	8	290
Henry	2	71
Howard	5	49
Huntington	5	196
Jackson	3	22
Jasper	1	3
Jay	7	269
Jefferson	3	12
Jennings	5	23

<i>County.</i>	<i>Reports.</i>	<i>Number of Sheep Affected.</i>
Johnson	6	55
Knox	3	20
Kosciusko	3	36
Lagrange	3	240
Lake	0	0
Laporte	6	69
Lawrence	0	0
Madison	4	21
Marion	6	102
Marshall	3	5
Martin	3	63
Miami	5	95
Monroe	6	36
Montgomery	8	798
Morgan	5	422
Newton	0	0
Noble	3	10
Ohio	0	0
Orange	5	33
Owen	4	20
Parke	3	205
Perry	1	3
Pike	4	27
Porter	3	22
Posey	3	11
Pulaski	1	2
Putnam	5	109
Randolph	6	38
Ripley	2	87
Rush	5	229
Scott	1	1
Shelby	2	22
Spencer	2	4
Starke	2	7
Steuben	2	5
St. Joseph	3	32
Sullivan	4	842
Switzerland	3	30
Tippecanoe	5	39
Tipton	2	269
Union	1	28
Vanderburgh	1	5
Vermillion	1	14

<i>County.</i>	<i>Reports.</i>	<i>Number of Sheep Affected.</i>
Vigo	2	13
Wabash	2	24
Warren	5	179
Warrick	6	21
Washington	3	9
Wayne	6	52
Wells	5	280
White	2	75
Whitley	5	73
Total	320	9.338

Upon receipt of the assessors' blanks, a number of letters were addressed to the owners of the sheep, asking how they introduced the scab into their flocks, and what they had done toward stamping out the trouble and with what success. The result of this and subsequent correspondence has led me to believe that many other conditions which would cause a rough fleece, has been mistaken for scab. This was found to be the case in nearly all the reports in which from one to six sheep were reported as being affected. Were we to estimate the number based upon the later correspondence, it would be about 200 true reports and 7,500 sheep affected. The majority of the sheep had been brought into the State for feeding purposes, and had come from the southwestern States. Many of the sheep had been dipped once at the St. Louis stock yards, and the purchaser believing that one dipping was sufficient, had neglected to dip after getting them home. All sheep now coming into the State from without are required to be dipped if they pass through yards at which there is government inspection. Sheep shipped from one point to another within the State, or into the State not passing through stock yards are not dipped, and it is in this way that disease is spread. Within the past year the inspectors at Indianapolis yards have required the dipping of sheep whether for State or interstate trade, with the happy result of greatly reducing the number of scabby sheep sent there.

LIVE STOCK LAW AFFECTING SPREAD OF SCAB.

Sheep scab is a contagious disease, and as such, is subject to the rules and regulations of the State Live Stock Sanitary Commission, but it is only within the present year that that Commission has taken any steps looking towards its control or toward stamping it out. At a meeting of the Commission March 15, 1899, the following order was passed and addressed to the Inspector of the Bureau of Animal Industry at Indianapolis:

"Dear Sir—At a meeting of the State Live Stock Sanitary Commission, held on March 15, 1899, the following order was passed, to which your

attention is called: 'That all sheep passing through the principal stock yards of the State, other than for immediate slaughter, and except exhibition sheep for show purposes at fairs, and except sheep that are pure bred or registered and to be used as heads of flocks for breeding purposes, and accompanied by a certificate of a qualified veterinarian, showing them to be free from exposure to infection, shall be dipped, at owner's expense, in dips as prescribed by the Bureau of Animal Industry, and further, that owing to the prevalence of scab among sheep and cholera among swine, that all cars after being unloaded, be disinfected before reloading or reshipment, and that all yards and pens be kept in good sanitary condition.'

"We further call your attention to Sections 14, 21 and 22 of the law, a copy of which is herewith enclosed.

"Respectfully yours,

"THE STATE LIVE STOCK SANITARY COMMISSION.

"By M. S. Claypool, President."

Sections 14, 21 and 22 of the act creating the Live Stock Sanitary Commission, are as follows:

Section 14. Any person or corporation who shall knowingly bring into the State any domestic animal or animals which are infected with any contagious or infectious disease, or any animal or animals which have been exposed to any such contagious or infectious disease, shall, for every such offense, forfeit and pay to the State not less than \$100 nor more than \$500, to be recovered by suit in the name of the State.

Section 21. The Commission is hereby authorized and required to co-operate with any board, commission or office acting under any present or future act of the Congress of the United States for the suppression and prevention of contagious and infectious diseases among domestic animals, and the same right of entry, inspection and condemnation of diseased animals upon private premises is hereby granted to the United States Board, Commission or Office as is hereby granted to the State Live Stock Sanitary Commission.

Section 22. Whereas, It is deemed necessary by the State Live Stock Sanitary Commission to supervise and inspect any of the lines of transportation in this State and the stock yards in connection with the same, suitable inspectors shall be appointed by the Commission, whose duty it shall be to examine such lines of transportation and stock yards as to condition, manner of transporting stock, and such other matters as such Commission may direct and report such examination in detail to said Commission, and the expense of such examination shall be paid by the corporations or individuals in charge of such lines of transportation or stock yards. Any such corporation or corporations or individuals owning or operating such lines of transportation or stock yards shall conform

promptly to all regulations made by said Sanitary Commission of which they shall have notice from such Commission, and for any neglect or omission to comply with such regulations as herein provided, they shall be subject to the fines and penalties in this act provided, to be enforced and collected according to the provisions of this act.

I was informed recently by the State Veterinarian that people do not report sheep scab and that all cases reported are quarantined and that about 1,500 head had been quarantined this year.

The following are the rules and regulations concerning the dipping of sheep in interstate trade.

REGULATIONS CONCERNING THE DIPPING OF SHEEP AFFECTED WITH SCAB.

The following communication from the United States Department of Agriculture, of comparatively recent date, shows what rules the National Government is instituting regarding sheep scab:

United States Department of Agriculture, Office of the Secretary,

Washington, D. C., July 20, 1899.

Whereas, The shipment of live stock affected with any contagious, infectious or communicable disease from one State or Territory to another, or from any State into the District of Columbia, or from the District into any State, is prohibited by the act of Congress, approved May 29, 1884; and

Whereas, The contagious disease of sheep known as scabies, or scab, exists in many parts of the United States, due notice of which was given in the Department Order of June 18, 1897; and

Whereas, Some of the preparations in which diseased sheep have been dipped by owners and stock yards companies, with the object of destroying the contagion and making legal the shipment of said sheep in interstate trade, have proved inefficient, and said sheep have disseminated the contagion, notwithstanding such treatment; and

Whereas, The damage and losses from scabies in sheep have been in some sections very heavy and discouraging to those engaged in the sheep industry,

It is Ordered, That from and after August 10, 1899, no sheep affected with scabies, and no sheep which has been in contact with others so affected, shall be allowed shipment from one State or Territory into another, or from any State into the District of Columbia, or from the District into any State, unless said sheep shall have first been dipped in a mixture approved by this Department.

The dips now approved are:

1. The tobacco-and-sulphur dip, made with sufficient extract of tobacco

to give a mixture containing not less than five one-hundredths of one per cent. of nicotine and two per cent. flowers of sulphur.

2. The lime-and-sulphur dip, made with eight pounds of unslacked lime and twenty-four pounds of flowers of sulphur to 100 gallons of water. The lime and sulphur should be boiled together for not less than two hours, and all sediment allowed to subside before the liquid is placed in the dipping vat.

The owner of the sheep is privileged to choose which one of the above mentioned dips shall be used for his animals. The Department will instruct inspectors to enforce due care in dipping sheep, but it assumes no responsibility for loss or damage to such animals, and persons who wish to avoid any risks that may be incident to dipping at the stock yards should see that their sheep are free from disease before they are shipped to market.

J. H. BRIGHAM,
Acting Secretary.

The following law, quoted from the Indiana Revised Statutes for 1867, put in force June 6 of that year, may appropriately be incorporated in this bulletin :

ALLOWING DISEASED SHEEP AT LARGE.

"Any person being the owner of sheep, or having the same in charge, who shall turn out or suffer any sheep having any contagious disease, knowing the same to be diseased, to run at large upon any common, highway or unenclosed ground, or who shall sell any such sheep, knowing the same to be diseased, without fully disclosing the fact to the purchaser, shall be deemed guilty of misdemeanor, and to be punished by a fine of not less than two nor more than twenty-five dollars for each diseased sheep, to be recovered as other penalties for like offenses."

Persons handling sheep from stock yards, or from a distance, should be quite familiar with the above regulations in order to avoid all trouble in this direction.

FIELD TESTS WITH FERTILIZERS ON HEAVY CLAY LANDS.

H. A. HUSTON.

One of the most frequent requests made of the Station is for advice about the kind and amount of fertilizers to be used. The requests generally take the form of asking that an analysis of a certain soil be made in order to determine what elements are deficient and for what crops the soil is best adapted. In many cases minute quantities of soil are enclosed with the letters, and in others a number of moist samples are put in paper sacks, packed in a box, and forwarded with a slip giving only the sender's name and a request for immediate analysis of the whole lot. When these samples are received, the packages have generally broken and the samples are so thoroughly mixed up that any attempt to do any work upon them or to form any reliable opinion of them would be to waste our time and labor.

It is by no means a simple matter to get a sample of soil that fairly represents a field, even though the field appears to be fairly uniform. A handful of earth taken at random in a field is practically valueless as a soil sample, and in cases where there may appear to be good reasons for an examination of the soil, we much prefer to visit the field and draw our own samples. Where this is impracticable, no samples should be forwarded until full directions for drawing a sample have been received from us. In many cases that we have been called upon to examine, the drainage conditions were such that it would be impossible to use fertilizing material to the best advantage or even at a profit until better drainage was provided. In such cases the results of a laboratory examination of the soil would fail to show what was really the first and most important thing to do.

There was a time when it was believed that the complete analysis of a soil would solve at once the question of its deficiencies and crop possibilities. This was a favorite topic for agricultural writers and it looked so plausible that many writers committed themselves to this idea before the necessary proofs of its correctness were at hand. There is just enough truth in this theory to make it dangerous, and not enough to make it of much value in its application to the worn lands of this

section. When the theory was tested by actual field work, it was found that in very many cases the indications given by the analyses made by the methods generally employed were not correct and could not be safely used in forming an opinion about the needs or the most profitable treatment of the land. To those not familiar with the methods formerly used in soil analysis, this statement doubtless seems somewhat remarkable. But if we stop to consider the real condition of the ingredients, which make up a soil, the explanation can readily be found.

The materials which plants take from the soil must be in a soluble condition before they become available for the plants' use. At any one time only very minute quantities of plant foods exist in the soil in this soluble state. By far the greater part is held in an insoluble condition, and this insoluble portion is very gradually rendered soluble under the complex action of a number of causes, of which heat, moisture, tillage and soil organisms are the most important. While these causes act on very insoluble materials and slowly convert some of them into soluble constituents fit for the use of the plant, this action is so gradual that the roots of living plants may be present at all times at the points where the action is taking place.

In contrast with this the laboratory methods by which most of the analyses have been made, subject the soil to the action of very strong acid, for a long time, at a high temperature. While this treatment may give results that may be, in the hands of skilled interpreters, of value in determining the capacity of virgin soils, it can hardly be said to show what we want to know about worn soils. The best way to find this out is to use plants as the means of testing and to apply different foods in combination or singly to measured portions of the field and weigh the resulting crops. This method, however, has the disadvantage of consuming much time and of being subject to the vicissitudes of the seasons, so that a series of crops must often be produced before a final decision is reached. On the other hand, valuable indications may be obtained in a single season. The educational value of such experiments, properly conducted, is very great, and the work has a living interest, both to the owner of the land on which it is conducted and to his neighbors. The discussion of the results obtained and the correct inferences to be drawn from them furnish material for work in meetings of farmers, which, because of its local interest, appeals far more strongly to the minds of the hearers than do general statements of results obtained elsewhere. Not only are the facts obtained and the indications drawn from them of interest and value, but the familiarity with the fertilizing materials used can be turned to very good advantage in the purchase of fertilizers for the rest of the farm. One who has carefully followed a properly conducted field test need not spend any time in considering whether he would buy 15, 20, 25 or 28 dollar "dust" solely on the basis of the price, or whether he will buy some particular brand that is extensively advertised,

but can go directly to the main point and calculate the number of pounds of each plant food in the goods and have a reliable basis on which to proceed in investing his money to the best advantage.

Field tests can be so arranged as to not interfere in the least with any of the ordinary operations from planting to harvest. The extra work is not great and consists in the application of the fertilizers, the work of a very few hours, and the weighing of the crop when harvested. In the case of wheat, it may be necessary to cut from one-half to one acre with a cradle, although on the Station farm, all the experimental plots are so arranged as to be cut with a self binder.

The cost for fertilizing materials is small and the necessary ingredients may now be obtained in the Indiana market in reliable form, since they are subject to inspection in the open market at all times.

As illustrating how such a test may be conducted, an account of some tests made on clay lands may be of interest.

In the spring of 1896, tests were begun on two farms in Orange county, and one farm in Monroe county.

The farms in Orange county were owned by Mr. B. F. Turley and Mr. W. A. Burton. The Turley farm is what is known in that section as an oak-clay land. The surface soil is of a light color and rests on a red clay subsoil. This red clay, which is very highly colored, rests in turn on limestone. The combined thickness of the two clays varies from two to twenty feet. The land on which the test was conducted was on the side of a moderate slope and the thickness of the clays was perhaps seven or eight feet. Much of the drainage of this section is through "sink holes," the water passing down through cavities in the limestones, and probably finding its way to Lost river, which is not far distant. The Turley farm has been under cultivation some seventy years, and at one time was so badly worn as to be considered of very little value. At present it is considered in fair condition and in a favorable season will produce thirty to forty bushels of corn per acre on clover sod.

The Burton farm is located about two miles northeast of the Turley farm and is of the same general character. The piece of land selected for testing on this farm was at the bottom of a low slope and about as near to a small swamp as it is customary to cultivate the land, and is said to be known as "crawfish land," while on the Turley land the plots were located near the summit of a similar slope. On the Turley farm, the wheat crop in 1895 was not considered worth cutting and hogs were turned in to eat the standing crop. The clover failed to make a fair stand and the remains of the wheat crop and the partial clover crop were plowed under and the field planted in corn. On the Burton farm the corn was planted on timothy sod.

The usual rotation on these lands is corn, wheat and clover. Sometimes oats are used between the corn and wheat crops.

The Campbell farm, four miles east of Bloomington, in Monroe county.

is of rather better quality than those in Orange county. But the portion under experiment was a basin of cold, badly drained upland clay, resembling in many respects the crawfish lands.

A mechanical analysis of the soils is given in Table I, which also includes a mechanical analysis of the soil of the Station farm, a dark, productive loam, resting on gravel.

TABLE I.—MECHANICAL ANALYSES OF SOILS ON THREE FARMS.

COMPOSITION.	Turley Farm. Per Cent.	Campbell Farm. Per Cent.	Station Farm. Per Cent.
Gravel	0.25	1.57	1.56
Coarse sand	0.16	0.67	2.56
Sand	7.05	12.23	13.95
Silt	39.82	45.62	35.42
Clay	47.64	35.21	36.54
Moisture and Organic	5.31	5.08	9.94

EXPERIMENTS WITH CORN.

On the Turley farm the fertilizer experiments were conducted on plats of one-tenth acre each, while on the Burton and Campbell farms the plats were one-twentieth acre each. As the plan was to locate the plats in such a way that the rows would be continuous with the rows of the rest of the field, the length of the plats was governed by the width of the planter. The one-tenth acre plat on the Turley farm was four rows wide and 292 feet long, and on the Burton farm, the length was 146 feet. On the Campbell farm the planter was wider, which reduced the length of the plat to 142 feet. Between each plat a space of two rows was left. This was planted in corn, but not fertilized. The corn crop on each of these spaces was weighed, compared with the yield of the plats receiving no fertilizer, and the results used in correcting the yield of the fertilized plats. This is necessary in case of corn, since the roots of the plant often extend more than the distance between two rows, and hence may get the benefit of some of the fertilizer applied to adjacent plats, especially when the fertilizer is applied broadcast. Nine plats and eight spaces were used in each field. The whole space was marked by substantial stakes at the corners. These corners were so located that the sides of the plats were paralleled to the side of the field where the planting started, and at such a distance from the side that the corner stake stood in the middle of the space between two rows. In this way there was no break in the rows and the plats under experiment were under the same field conditions as the remainder of the fields of twenty to forty acres in the midst of which they were located.

As these lands seemed in some respects to resemble some of the lands of the Kentucky Station, which had been found to require relatively

large amounts of potash to produce a good corn crop, we selected a formula containing more potash than is usual in fertilizers used on corn in this State. This formula called for two parts of nitrogen, seven parts of available phosphoric acid, and six parts of potash, and was used in such an amount as to give ten pounds of nitrogen, thirty-five pounds available phosphoric acid and thirty pounds actual potash to the acre, where all ingredients were used. On Plat 3, a double quantity of potash, sixty pounds per acre, was used. The diagram shows the plan of the plats and the material applied to each, on the Turley farm.

On the Burton and Campbell farms the plan was the same, but since only one-twentieth acre plats were used, the quantities were half as great.

As these lands were very heavy, lime was used on Plat 8, in connection with the same fertilizer as was used on Plat 2. On the Burton farm, however, owing to the error of a workman, the lime was put on Plat 9 instead of Plat 8, as shown in the table giving yields.

The season was a favorable one for corn and the crop on the whole field was above the average for these lands.

On the Turley farm the corn was not graded, since it is the custom to feed all the corn. The fodder was weighed. On the Burton farm the

TABLE II.—RESULTS OF FERTILIZER EXPERIMENTS ON CORN ON TURLEY FARM.

Plat 1-10 Acre	FERTILIZER USED.	Corn.	Stover.	Gain.	
		Bushels Per Acre.	Bushels Per Acre.	Corn.	Stover.
1	None	37.3	1470	. . .	. . . . .
2	Nitrate of soda, 6 pounds Dissolved bone black, 23 pounds. Muriate of potash, 6 pounds.	47.2	1962	9.9	492
3	Nitrate of soda, 6 pounds Dissolved bone black, 23 pounds. Muriate of potash, 12 pounds	47.1	1939	9.8	469
4	Dissolved bone black, 23 pounds. Muriate of potash, 6 pounds.	48.5	2062	11.2	592
5	None	37.3	1470	. . .	. . . . .
6	Nitrate of soda, 6 pounds Dissolved bone black, 23 pounds.	40.2	1633	2.9	163
7	Nitrate of soda, 6 pounds Muriate of potash, 6 pounds.	40.6	1595	3.3	125
8	Nitrate of soda, 6 pounds Dissolved bone black, 23 pounds Muriate of potash, 6 pounds. Lime, 140 pounds.	41.1	1618	3.8	148
9	None	37.3	1470	. . .	. .

stalks were cut above the ear, and the butts left in the field. On this farm, only the total corn was weighed.

On the Campbell farm the corn was graded and fodder weighed. These various methods were used in order to conform as closely as possible to the actual farm practice on each farm. The average of plats with no fertilizer is used in the table, and yields are corrected, as explained above.

Of these three sets of results, those on the Turley farm are undoubtedly the more reliable, because of the larger plats and the more even

TABLE III.—RESULTS OF FERTILIZER EXPERIMENTS ON CORN ON THE BURTON FARM.

Plat 1-20 Acre	FERTILIZER USED.	Yield.	
		Corn. Bushels Per Acre.	Gain.
1	None.	36.6	. . . . .
2	Nitrate of soda, 3 pounds Dissolved bone black, 12½ pounds Muriate of potash, 3 pounds	48.6	12.0
3	Nitrate of soda, 3 pounds Dissolved bone black, 12½ pounds Muriate of potash, 6 pounds	47.1	10.5
4	Dissolved bone black, 12½ pounds Muriate of potash, 3 pounds	44.3	7.7
5	None.	36.6	. . . . .
6	Nitrate of soda, 3 pounds Dissolved bone black, 12½ pounds	53.4	17.8
7	Nitrate of soda, 3 pounds Muriate of potash, 3 pounds	52.9	16.3
8	Nitrate of soda, 3 pounds Dissolved bone black, 12½ pounds Muriate of potash, 3 pounds	41.8	5.2
9	Lime, 140 pounds	43.7	7.1

crop producing capacity of the different plats. This was clearly shown in the yields on the spaces between the plats. It will be seen that on the Turley farm whenever potash or phosphoric acid are not used, the yield falls off, but a double quantity of potash produced no increase in yield, showing that the formula used contained enough. The nitrogen seems to have no effect in increasing the crop, although the nitrogen in nitrate of soda is at once available. This is a matter of much importance, since, if confirmed, it would result in a saving of about 25 per cent. in the cost of fertilizers used by us, and of nearly 50 per cent. of the cost of the fertilizers usually applied to corn. The effect of the lime on the Turley land

was not seen in the yield. This is doubtless due to the fact that the lime was not properly used in that it was applied at practically the same time as the soluble phosphate and its effect was to render the phosphoric acid insoluble.

In ordinary farm practice, the lime would have been applied some months in advance of the fertilizers. The result of the lime alone may be seen on Plat 9 on the Burton farm, where it resulted in an increase of seven bushels per acre. A comparison of Plats 1 to 5 on all three farms shows that a mixture of acid phosphate and muriate of potash in the proportion of four pounds of phosphate to one of muriate gives practically as good results as a mixture containing nitrate of soda in addition to these.

The comparison of Plats 6 to 9 is somewhat puzzling. But when the yields of the spaces between them were taken into account, it was found

TABLE IV.—RESULTS OF FERTILIZER EXPERIMENTS ON CORN ON THE CAMPBELL FARM.

Plat 1-20 Acre.	FERTILIZER USED.	Sound Corn. Bush. per Acre.	Bad Corn. Bush. per Acre.	Fodder Lbs. per Acre.	GAIN.	
					Sound Corn.	Fodder
1	None	29.4	4.8	1500	. . . . .	. . . . .
2	Nitrate of soda, 3 pounds Dissolved bone black, 12½ pounds Muriate of potash, 3 pounds	37.4	6.1	1800	8.0	300
3	Nitrate of soda, 3 pounds Dissolved bone black, 12½ pounds Muriate of potash, 6 pounds	34.6	5.5	1680	5.2	180
4	Dissolved bone black, 12½ pounds Muriate of potash, 3 pounds	40.3	3.8	1700	10.9	200
5	None	29.4	4.8	1500	. . . . .	. . . . .
6	Dissolved bone black, 12½ pounds Nitrate of soda, 3 pounds	44.3	3.4	2180	14.9	680
7	Nitrate of soda, 3 pounds Muriate of potash, 3 pounds	27.0	2.6	1400	*-2.4	*-100
8	Nitrate of soda, 3 pounds Dissolved bone black, 12½ pounds Muriate of potash, 3 pounds Lime, 140 pounds	35.4	2.0	1560	6.0	60
9	None	29.4	4.8	1500	. . . . .	. . . . .

* Loss.
that on the Turley farm the land was even, while on the Burton farm Plats 6 and 7 were on land having a higher productive capacity. On Plat 8 of the Burton farm, the stand was quite imperfect. This plat should have yielded the same as Plat 2. On the Campbell farm, Plats 7 and 8

were damaged by standing water, while Plat 6 was somewhat better land, as shown by the higher yields of the spaces on each side of it.

On the Burton farm, the part of the field not used for experimental purposes was fertilized with a complete fertilizer containing 10 per cent. available phosphoric acid, 2.5 per cent. nitrogen and 2.5 per cent. potash, at the rate of 100 pounds per acre. This was drilled in with the corn while the fertilizers used in the experimental work were applied broadcast and harrowed in. Up to the time of the last cultivation, the portion of the field where the fertilizer was drilled in, presented a better appearance and seemed to promise a better yield. The color was decidedly darker. At the request of a neighboring farmer, who had been watching the field with a good deal of interest and who believed that the experimental part of the field would yield less than the rest of it, a plat was selected in the part of the field not under experiment, and the crop harvested and weighed. The increase, due to 100 pounds of fertilizer drilled in, was only 1.2 bushels per acre, a result not at all profitable.

The probable explanation of the difference in appearance is that the fertilizer was dropped close to the seed and its effect was immediate, and the plant food practically used up before the ear was well formed, while in the broadcasting the material was not so quickly used, but became available at a later period in the growth of the plant. On the experimental part of the field more fertilizer was used, but not in sufficient excess to wholly account for the difference in yields.

So far as we may judge from this single case, the evidence is in favor of harrowing in the fertilizer for corn, instead of drilling it with the corn. The great range of the roots of the corn plant may influence this.

EXPERIMENTS WITH WHEAT.

Following the above experiments with corn, a set of experiments with wheat was made on the Campbell and Turley farms. The owner decided to put in oats on the Burton farm, so that no more work was undertaken on that land.

EXPERIMENTS ON THE CAMPBELL FARM.

The same plats were used as for corn, but the formula of the fertilizer was changed, so as to provide for a fertilizer containing nitrogen 4, available phosphoric acid 7, potash 4. This, of course, is quite different from the usual wheat fertilizers used in this State, which have all kinds and sorts of composition, but very few of them contain as much nitrogen or potash as this one, and most of them contain more phosphoric acid. However, in this work we were attempting to test the fertilizer requirements of these soils, and it was necessary to use enough nitrogen and potash to produce some effect, and yet not use more than would be practicable in actual field practice, should such amounts be found necessary. The formula called for nitrate of soda, seventy-four pounds; dissolved bone,

124 pounds, and muriate of potash, twenty-four pounds per acre. The season was very unfavorable for wheat and the crop was practically a failure on all lands in that section, excepting those that had been very thoroughly prepared and had been kept much above the average of the region in fertility.

The causes of the short crop were the very hard condition of the ground after the corn crop was removed, which made it very difficult to put the soil in condition for seeding, unless it was plowed, and the un-

TABLE V.—RESULTS OF FERTILIZER EXPERIMENTS ON WHEAT ON THE CAMPBELL FARM.

Plat 1-20 Acre.	FERTILIZER USED.	POOLS WHEAT.	
		Grain. Bushels Per Acre.	Straw. Pounds Per Acre.
1	None	4.1	65
2	Nitrate of soda, 3.7 pounds Dissolved bone black, 6.2 pounds Muriate of potash, 1.2 pounds	5.2	80
3	Nitrate of soda, 3.7 pounds Dissolved bone black, 6.2 pounds Muriate of potash, 2.4 pounds	4.5	70
4	Dissolved bone black, 6.2 pounds Muriate of potash, 1.2 pounds	3.7	60
5	None	3.5	50
6	Dissolved bone black, 6.2 pounds Nitrate of soda, 3.7 pounds	7	100
7	Nitrate of soda, 3.7 pounds Muriate of potash, 1.2 pounds	3.2	60
8	Nitrate of soda, 3.7 pounds Dissolved bone black, 6.2 pounds Muriate of potash, 1.2 pounds Lime previous spring, 140 pounds	6.3	105
9	None	3.6	65

precedently heavy rains of the spring, which washed the land very severely, and left the surface so badly puddled that with the exception of the plats to which lime was applied the previous spring, it resembled a brick yard rather than a wheat field. On account of these exceedingly unfavorable conditions, it would be unsafe to base any conclusions on the results of these tests. Yet, certain facts were brought out which may make the work worth recording. The fertilizers were applied broadcast and harrowed in. The wheat was drilled at the same time with that on the field, of which the plats formed a part.

The remainder of the field in which these plats were located was sown in wheat and a fertilizer containing nitrogen, 0.76 per cent.; available phosphoric acid, 9.15 per cent., potash, 2.73 per cent., was drilled in with the wheat at the rate of 125 pounds per acre. The land on which the plats were located was the least productive part of the field. The yield on the field was nine and three-fourths bushels per acre.

So far as any inference can be drawn from the results on the plats, it would appear that the potash has very little influence, and that phosphoric acid and nitrogen were the substances in which this land was deficient, so far as the wheat crop is concerned. But on such a short crop, such inferences should be made with much caution and would need to be tested under normal conditions. There were, however, three facts that showed very clearly. The method of applying fertilizer broadcast gave a very uneven stand as compared with the part of the field where the fertilizer was drilled. The low yield was due to this defective stand. Plats 1, 5 and 9, to which no fertilizer was applied, showed no stand of grass following the wheat, while all the other plats had a very good stand of grass. The lime applied on the corn crop the previous spring on Plat 8, the plat most unfavorably located, as much water stood on it during the winter and spring, showed a marked effect in preventing puddling of the surface during the very heavy rains of the spring. This surface to which lime had been applied was loose, and absorbed the water as it fell, which prevented surface washing.

EXPERIMENTS ON THE TURLEY FARM.

On this farm the old plats were retained and seven additional ones used. Much interest is manifested by purchasers of fertilizers in the question of rock as against bone goods, and in the use of real dissolved bone, raw bone and steamed bone. A part of these additional plats were, therefore, used for illustrating this point, and at the same time served to compare organic nitrogen from bone and dried blood with nitrogen derived from nitrate of soda. Plats 15 and 16 were used solely to compare the effect of broadcasting and drilling the same fertilizer at the same rate per acre.

The most conspicuous feature of this table is the remarkably small yields. This is in part to be attributed to reduced stand caused by not drilling the fertilizer, but the average of the forty acres in which the plats were located was less than four bushels per acre.

In addition to the bad effects of climatic conditions mentioned above, this crop suffered from smut. Under such circumstances no conclusions can be drawn as to the fertilizer requirements of the soil. On the plats the same uneven stand was noticed, while in the general field where the fertilizer was drilled the stand was much more uniform.

The plat to which lime had been applied the previous spring was very

conspicuous, not only having the best yield on the field but the surface remained loose and friable when the rest of the field had been puddled. Plats 10, 11, 12, and 13 had the same amounts of nitrogen, available phosphoric acid and potash at Plat 2, but the nitrogen was all from organic sources instead of from nitrate of soda, and the available phosphoric acid was from real bone on Plats 10, 12 and 13, while the available phosphoric

TABLE VI.—EXPERIMENTS WITH FERTILIZERS ON WHEAT ON THE
TURLÉY FARM.

Plat, 1-10 Acre.	FERTILIZER USED.	FULTZ WHEAT.	
		Grain. Bushels per Acre.	Straw. Pounds per Acre.
1	None	1.1	15
2	{ Nitrate of soda, 7.4 pounds Dissolved bone black, 12.4 pounds Muriate of potash, 2.3 pounds }	1.9	25
3	{ Nitrate of soda, 7.4 pounds Dissolved bone black, 12.4 pounds Muriate of potash, 4.6 pounds }	1.6	20
4	{ Dissolved bone black, 12.4 pounds Muriate of potash, 2.3 pounds }	1.9	20
5	None	0.9	13
6	{ Nitrate of soda, 7.4 pounds Dissolved bone black, 12.4 pounds }	1.8	25
7	{ Nitrate of soda, 7.4 pounds Muriate of potash, 2.3 pounds }	2.0	30
8	{ Nitrate of soda, 7.4 pounds Dissolved bone black, 12.4 pounds Muriate of potash, 2.3 pounds Lime previous spring, 140 pounds }	4.1	40
9	None	0.7	15
10	Acidulated bone, dried blood and potash, equal to plat 2	2.4	35
11	Acid phosphate, dried blood and potash, equal to plat 2	3.2	35
12	Raw bone, dried blood and potash, equal to plat 2	3.0	37
13	Steamed bone, dried blood and potash, equal to plat 2	3.1	45
14	None	1.0	15
15	10 pounds bone, broadcast	2.4	35
16	10 pounds bone, drilled in	2.9	30

acid on Plat 11 was from plain dissolved rock. It would be unsafe to say from this defective experiment that the available phosphoric acid from rock is better than that from bone.

But while little light is thrown on the matter of the forms of phosphoric acid, the fact that all four of these plats containing organic nitrogen exceed in yield those on which nitrate of soda was used, seems to indicate that the excessive rains washed away the nitrate, while the insoluble organic forms remained and became available later on.

The results on Plats 15 and 16 indicate that with the same fertilizer there is an advantage in drilling. This part of the work was duplicated on a larger scale on the Station farm, on a good loam well adapted to wheat. The results here were alike for both broadcasting and drilling.

But on this land there is rarely any difficulty in securing a full stand on unfertilized plats, and the loam would readily permit of the distribution of soluble goods. On the hard compact clay, the distribution through the soil would be much more difficult, and the presence of minute quantities of fertilizer near the germinating wheat, such as is provided when the fertilizers are drilled in with the seed, is doubtless of much importance in nourishing the plants in the first stages of their growth.

On these heavy lands, under the usual conditions, it would seem necessary to conduct the tests for wheat so as to provide for drilling the fertilizer and wheat together if reliable results are to be obtained. This would require larger areas for each plat and much more labor in harvesting and threshing the crop. It is hoped to take the question up on a larger scale in the future. On the other hand, with the corn crop, broadcasting does well, and the results obtained, especially on the Turley farm, where the land was very uniform, may be taken as a fair example of what may be obtained from such tests.

Notwithstanding the fact that these lands rest on limestone, the use of lime at the rate of 1,000 to 2,000 pounds per acre will doubtless prove very profitable on them, for the surface soil is separated from the limestone by a very impenetrable clay layer and neither the soil or subsoil contains any appreciable quantity of carbonate of lime.

The lime on these soils undoubtedly acts to some extent as a plant food, but by far its more important effect is in flocculating the clay so that it will not puddle when wet. This means that we can work the land sooner after a rain and also continue the working in dry weather, since the clay will not dry in hard lumps, but will remain friable. These clays which are imperfectly drained are often acid in reaction, and when in this condition the best of fertilizers fail to produce the expected effect, as has been very fully demonstrated by Dr. Wheeler, of the Rhode Island Station. The lime would correct this acidity of the soil and permit the plants to obtain the full benefit of the fertilizers used. But the lime should be applied and mixed with the soil some months in advance of the use of soluble phosphates, in order not to render these insoluble.

The effect of the lime will extend over a three course rotation at least, and will very materially aid in getting a good stand of grass or clover. The results on Plat 9 of the Burton farm, where lime alone was used, clearly indicates what may be expected from the application of lime. But it must be remembered that the lime is only an indirect fertilizer, and while it is of great value in producing an increased crop, this increase removes larger quantities of plant food, which must ultimately be replaced if the productiveness of the soil is to be maintained. The continued use of lime as a substitute for manure has always proved disastrous when kept up for a series of years. But where it is used properly to put the soil

in a more favorable condition to utilize the manure or fertilizers, it is one of the most valuable sources of soil improvement.

Acknowledgements are due Mr. B. F. Turley, Mr. Frank Turley, Mr. W. A. Burton and Mr. G. P. Campbell, for the use of land and for most of the labor involved in this work, and for much careful attention to the crops. Acknowledgments are also due to the C. I. and L. Ry. (Monon) for transportation.

REPORT

— ON —

Farmers' Institutes,

UNDER THE AUSPICES OF

PURDUE UNIVERSITY SCHOOL OF AGRICULTURE,

For the Institute Season of 1899-1900.

REPORT OF SUPERINTENDENT.

The Institute season of 1899-1900 opened November 27, 1899, and closed March 17, 1900, according to the schedule previously arranged by the Superintendent of Institutes. In addition to the schedule which included an institute in each county, several counties which did not exhaust their appropriation on the annual institute held second meetings, and one county held two such meetings under State control. A few of the December meetings were not advertised sufficiently, and consequently the attendance was not what it should have been. With the exception of a few counties, the meetings were more fully advertised than in any previous year, and the results show in the interest manifested and in the attendance, which is greater than in any former year. Severe weather interfered with the attendance of a few meetings in January and February, but in the main the attendance in these months was excellent.

Separate women's sessions constitute an interesting feature of the past season's work. These separate sessions were inaugurated by Tippecanoe county some two years ago, and probably twenty of the counties held such separate sessions during the past season. The reports of these

separate sessions are very encouraging. Judging from the correspondence there will be an increased demand for women workers and such separate sessions next season. These separate sessions have two especially good features to commend them; (1) they afford the 'farmers' wives and daughters as well as the farmers an opportunity to discuss subjects of peculiar interest which could not well be taken up at the general sessions; (2) in counties where the hall capacity is limited the separate sessions in the afternoon enable the local authorities to better accommodate all who wish to attend.

The effect of the Conference of Institute Workers held at Purdue University, Lafayette, Ind., October 18-19, was marked, especially in counties represented at the Conference. This Conference was the second one of this kind, the first being held one year previous. So much interest was manifested, and so many have expressed a desire for their continuation, that these conferences will doubtless become a regular feature of the Institute work.

The following list of institutes held under State auspices during the current season includes the regular schedule previously arranged by the superintendent and also the additional meetings held in counties that did not exhaust their apportionment upon the annual institute:

**COMPLETE LIST OF FARMERS' INSTITUTES HELD UNDER STATE
AUSPICES FOR THE SEASON OF 1899-1900.**

NOVEMBER.

PLACE OF MEETING.	DATE.	ASSIGNED SPEAKERS.
Floyd, Ellettsville	Nov. 27-28	Cal. Husselman, Mrs. J. W. Bates.
Perry, Rome	Nov. 27-28	H. S. Wolfe, L. D. Creel.
Vanderburgh, Kamp School	Nov. 27-28	H. F. McMahan, J. H. Gwaltney.
Franklin, Ellettsville	Nov. 27-28	E. M. C. Hobbs, Mrs. C. W. Thomas.
Owen, Spencer	Nov. 27-28	J. L. Shawver, E. H. Collins.
Madison, Ellettsville	Nov. 29-30	Cal. Husselman, Mrs. J. W. Bates.
Spencer, Ellettsville	Nov. 29-30	H. S. Wolfe, L. D. Creel.
Pike, Warsaw	Nov. 29-30	H. F. McMahan, J. H. Gwaltney.
Clark, Ellettsville	Nov. 29-30	E. M. C. Hobbs, Mrs. C. W. Thomas.
Greene, Ellettsville	Nov. 29-30	J. L. Shawver, E. H. Collins.
Washington, Salem	Dec. 1-2	Cal. Husselman, Jas. Riley.
Warren, Ellettsville	Dec. 1-2	H. S. Wolfe, L. D. Creel.
Franklin, Ellettsville	Dec. 1-2	H. F. McMahan, J. H. Gwaltney.
Scott, Scottsburg	Dec. 1-2	Prof. W. C. Little, E. M. C. Hobbs.
Clay, Ellettsville	Dec. 1-2	J. L. Shawver, E. H. Collins.

DECEMBER.

Orange, Orleans	Dec. 4-5	Cal. Husselman, H. F. McMahan.
Madison, Ellettsville Church	Dec. 4-5	James Riley, L. D. Creel.
Jefferson, Ellettsville	Dec. 4-5	Mrs. J. W. Bates, J. L. Shawver.
Marion, Ellettsville	Dec. 4-5	O. F. Lane, H. S. Wolfe.
Reed, Ellettsville	Dec. 4-5	J. A. McFarlin, D. B. Johnson.
Lawrence, Bedford	Dec. 6-7	Cal. Husselman, H. F. McMahan.
Swain, Ellettsville	Dec. 6-7	James Riley, L. D. Creel.
Ellettsville, Ellettsville	Dec. 6-7	Mrs. J. W. Bates, J. L. Shawver.
Davies, Washington	Dec. 6-7	O. F. Lane, H. S. Wolfe.
Newton, Ellettsville	Dec. 6-7	J. A. McFarlin, D. B. Johnson.
Monroe, Ellettsville	Dec. 8-9	Cal. Husselman, H. F. McMahan.
J. W. Bates, Ellettsville	Dec. 8-9	James Riley, L. D. Creel.
Dearborn, Pleasant View Grange	Dec. 8-9	Mrs. J. W. Bates, J. L. Shawver.
Hall, Ellettsville	Dec. 8-9	O. F. Lane, H. S. Wolfe.
Sullivan, Sullivan	Dec. 8-9	J. A. McFarlin, D. B. Johnson.
White, Ellettsville	Dec. 8-9	Mrs. J. W. Bates, J. L. Shawver.
Warren, West Lebanon	Dec. 11-12	Mrs. J. C. Erwin, Cal. Husselman.
Grant, Marion	Dec. 11-12	J. A. McFarlin, James Riley.
Wayne, Ellettsville	Dec. 11-12	Mrs. J. W. Bates, D. B. Johnson.
Fountain, Veedsburg	Dec. 13-14	Mrs. J. C. Erwin, Cal. Husselman.
Wabash, Wabash	Dec. 13-14	E. H. Collins, J. A. McFarlin.
Fayette, Connersville	Dec. 13-14	Mrs. J. W. Bates, D. B. Johnson.
Parker, Ellettsville	Dec. 15-16	Mrs. J. C. Erwin, Cal. Husselman.
Cass, Logansport	Dec. 15-16	E. H. Collins, J. A. McFarlin.
Union, Liberty	Dec. 15-16	Mrs. J. W. Bates, D. B. Johnson.
Vermilion, Dana	Dec. 18-19	H. F. McMahan, H. H. Keim.
Shelby, Shelbyville	Dec. 18-19	Mrs. J. C. Erwin, Cal. Husselman.
Jay, Portland	Dec. 18-19	E. H. Collins, E. M. C. Hobbs.
Bartholomew, Hope	Dec. 20-21	Mrs. J. C. Erwin, Cal. Husselman.
Blackford, Hartford City	Dec. 20-21	E. H. Collins, E. M. C. Hobbs.
Montgomery, Crawfordville	Dec. 20-21	H. F. McMahan, H. H. Keim.
Carroll, Camden	Dec. 22-23	H. H. Keim, H. F. McMahan.
Decatur, Burney	Dec. 22-23	Mrs. J. C. Erwin, Cal. Husselman.
Johnson, Franklin	Dec. 22-23	E. H. Collins, E. M. C. Hobbs.
Brown, Nashville	Dec. 27-28	H. F. McMahan, Mrs. J. W. Bates.
Vigo, Terre Haute	Dec. 29-30	Mrs. J. W. Bates, H. F. McMahan.

FARMERS' INSTITUTES—Continued.

JANUARY.

PLACE OF MEETING.	DATE.	ASSIGNED SPEAKERS.
Hendricks, Danville	Jan. 8-9	Prof. H. A. Huston, Mrs. J. W. Bates.
Adams, Decatur	Jan. 8-9	A. Johnson, Cal. Husselman.
Knox, Bicknell	Jan. 8-9	H. S. Wolfe, E. H. Collins.
Hamilton, Westfield	Jan. 10-11	Prof. C. S. Plumb, Mrs. J. W. Bates.
Wells, Bluffton	Jan. 10-11	Cal. Husselman, Mrs. D. H. Miller.
Pulaski, Winamac	Jan. 10-11	H. F. McMahan, Mrs. J. C. Erwin.
Gibson, Princeton	Jan. 10-11	H. S. Wolfe, E. H. Collins.
Delaware, Shideler	Jan. 12-13	T. E. Bowler, Mrs. J. W. Bates.
Allen, Ft. Wayne	Jan. 12-13	Cal. Husselman, Mrs. D. H. Miller.
Jasper, Rensselaer	Jan. 12-13	H. F. McMahan, Mrs. J. C. Erwin.
Posey, New Harmony	Jan. 12-13	H. S. Wolfe, E. H. Collins.
DeKalb, Waterloo	Jan. 15-16	Cal. Husselman, Mrs. J. W. Bates.
Hancock, Greenfield	Jan. 15-16	Mrs. J. C. Erwin, H. F. McMahan.
Howard, Kokomo	Jan. 15-16	D. B. Johnson, J. A. McFarlin.
Steuben, Angola	Jan. 17-18	Cal. Husselman, Mrs. J. W. Bates.
Randolph, Winchester	Jan. 17-18	Mrs. J. C. Erwin, H. F. McMahan.
Miami, Peru	Jan. 17-18	D. B. Johnson, J. A. McFarlin.
Jackson, Seymour	Jan. 17-18	M. Truesler, T. E. Bowler.
Noble, Albion	Jan. 19-20	Cal. Husselman, Mrs. J. W. Bates.
Henry, Newcastle	Jan. 19-20	Mrs. J. C. Erwin, H. F. McMahan.
Huntington, Huntington	Jan. 19-20	D. B. Johnson, J. A. McFarlin.
Putnam, Greencastle	Jan. 19-20	M. Truesler, T. E. Bowler.
Elkhart, Goshen	Jan. 22-23	Mrs. J. C. Erwin, H. F. McMahan.
Fulton, Rochester	Jan. 22-23	Mrs. J. W. Bates, Jas. Riley.
Starke, Knox	Jan. 23-24	J. A. McFarlin.
St. Joseph, South Bend	Jan. 24-25	Mrs. J. C. Erwin, H. F. McMahan.
Laporte, Laporte	Jan. 24-25	Mrs. J. W. Bates, Jas. Riley.
Kosciusko, Warsaw	Jan. 26-27	Mrs. J. C. Erwin, H. F. McMahan.
Lagrange, Lagrange	Jan. 26-27	Mrs. J. W. Bates, Jas. Riley.
Tippecanoe, Lafayette	Jan. 28-30	E. M. C. Hobbs, D. B. Johnson.
Clinton, Frankfort	Jan. 31-Feb. 1	D. B. Johnson, E. M. C. Hobbs.

FEBRUARY.

Tipton, Tipton	Feb. 2-3	E. M. C. Hobbs, D. B. Johnson.
Madison, Anderson	Feb. 5-6	Mrs. J. W. Bates, Cal. Husselman.
Boone, Lebanon	Feb. 5-6	Mrs. J. C. Erwin, H. S. Wolfe.
Franklin, Brookville	Feb. 7-8	Mrs. J. W. Bates, C. I. Husselman.
Marion, Cumberland	Feb. 7-8	Mrs. J. C. Erwin, H. S. Wolfe.
Rush, Rushville	Feb. 9-10	Cal. Husselman, Prof. J. Troop.
Morgan, Mooresville	Feb. 9-10	H. S. Wolfe, Mrs. J. W. Bates.
Marshall, Plymouth	Feb. 12-13	H. F. McMahan, J. N. Babcock.
Lake, Crown Point	Feb. 13-14	Mrs. J. W. Bates, Cal. Husselman.
Whitley, Columbia City	Feb. 14-15	H. F. McMahan, J. N. Babcock.
Porter, Valparaiso	Feb. 15-16-17	Mrs. J. W. Bates, J. N. Babcock, Cal. Husselman, Prof. W. C. Latta.

SECOND MEETINGS.

Jennings, Butlerville	Feb. 9-10	Prof. H. A. Huston.
Lawrence, Bryantville	Feb. 15	Dr. H. S. Wolfe.
Starke, Hamlet and N. Judson	Feb. 19-20	J. A. McFarlin.
Montgomery, Ladoga	Feb. 23	
Clark, Borden	Feb. 23-24	J. A. Burton, H. S. Wolfe, Wm. Jack.
Howard, Kokomo	Feb. 27-28	E. H. Collins.
Johnson, Greenwood	Mar. 2-3	Prof. J. Troop.
Jefferson, China	Mar. 23-24	Prof. C. S. Plumb.
Randolph, Parker	Mar. 24	James Riley.
Marion, Broad Ripple	Mar. 28-29	Prof. C. S. Plumb.
Owen, Freedom	Mar. 30-31	T. E. Bowler, Prof. H. A. Huston.

In addition to the 104 institutes held under State auspices, twenty-three counties have reported independent institutes held within the year ending March 31, 1900. The following is a list of the counties reporting such institutes and the number held in each:

<i>County.</i>	<i>No. Held.</i>
Allen	7
Benton	1
Boone	1
Brown	3
Dearborn	1
Decatur	1
Dekalb	1
Delaware	1
Franklin	1
Fulton	5
Huntington	6
Jay	1
Jennings	1
Lagrange	1
Marshall	1
Perry	1
Ripley	1
Rush	1
Tippecanoe	4
Wabash	3
Warrick	1
Washington	1
Whitley	1
Total	45

It will be seen from the list above that the total number of institutes held during the year is 149. It is believed that this record surpasses that of any previous year. In view of the limited appropriation, which is less than one-third of that of many other States, the results attained are very gratifying, indeed, because they clearly show the public spirit and generosity of the people of Indiana. Such results would be entirely impossible but for the generous support rendered by the trustees of Purdue University, the railway lines, the farmers, and the public-spirited citizens of the cities and towns of the State.

The following table gives the average attendance at the several session of each institute held under State auspices during the past year. The table also gives for comparison the attendance for the year previous and the general averages for several years past. It is very gratifying to note that sixty-two counties show an increased attendance the past year over the year previous:

TABLE SHOWING ATTENDANCE AT FARMERS' INSTITUTES.

County.	1899-1900.		1898-1899.	
	No. Sessions Held.	Aver. Attend- ance.	No Sessions Held.	Aver. Attend- ance.
Adams	5	206	5	205
Allen	5	286	5	199
Bartholomew	5	480	5	515
Benton	4	43	5	171
Blackford	5	161	4	155
Boone	5	340	5	60
Brown	5	123	5	124
Carroll	4	102	4	81
Cass	4	173	4	164
*Clark	10	57	5	100
Clay	5	77	5	192
Clinton	5	375	5	222
Crawford	5	96	5	56
Davless	5	316	4	335
Dearborn	5	123	5	100
Decatur	5	174	5	381
Dekalb	5	372	6	267
Delaware	5	124	4	89
Dubois	5	155	5	184
Elkhart	5	785	5	390
Fayette	5	109	5	145
Floyd	5	90	5	50
Mountain	5	194	5	143
Franklin	5	188	5	272
Fulton	5	682	5	665
Gibson	5	277	5	185
Grant	4	359	5	456
Greene	5	69	5	45
Hamilton	5	244	5	315
Hancock	5	353	5	257
Harrison	5	260	5	190
Hendricks	5	331	4	287
Henry	5	860	5	735
*Howard	9	288	5	260
Huntington	4	560	4	561
Jackson	5	170	5	152
Jasper	5	219	6	170
Jay	5	227	6	216
*Jefferson	10	195	5	201

*Two sessions. †Three sessions.

TABLE SHOWING ATTENDANCE AT FARMERS' INSTITUTES—Cont.

County.	1899-1900.		1898-1899.	
	No. Sessions Held.	Aver. Attend- ance.	No. Sessions Held.	Aver. Attend- ance.
*Jennings	10	63	5	46
*Johnson	9	321	4	294
Kosciusko	7	615	6	530
Knox	6	646	5	451
Lagrange	5	642	5	602
Lake	5	229	5	227
LaPorte	5	360	6	153
*Lawrence	7	67	5	39
Madison	5	450	5	339
*Marion	5	167	5	90
Marshall	5	440	5	310
Martin	5	35	5	107
Miami	5	212	5	166
Monroe	5	172	5	131
*Montgomery	7	290	5	403
Morgan	5	406	5	289
Newton	5	108	5	97
Noble	5	197	5	285
Ohio	4	136	5	83
Orange	5	204	5	304
*Owen	8	148	4	122
Parke	4	354	5	260
Perry	6	311	6	159
Pike	5	217	5	169
Porter	5	165	5	148
Posey	5	414	5	372
Pulaski	5	179	5	173
Putnam	5	386	5	274
*Randolph	8	397	5	590
Ripley	5	152	5	136
Rush	5	154	5	178
Scott	6	133	5	121
Shelby	5	500	5	313
Spencer	5	199	5	183
St. Joseph	4	1,000	5	1,500
†Starke	11	107	5	108
Steuben	5	465	5	402
Sullivan	5	101	5	98
Switzerland	5	285	5	259
Tippecanoe	4	163	4	261
Tipton	5	586	5	525

TABLE SHOWING ATTENDANCE AT FARMERS' INSTITUTES—Cont

County.	1899-1900.		1894-1899.	
	No. Sessions Held.	Aver. Attend- ance.	No. Sessions Held.	Aver. Attend- ance.
Union	4	216	4	305
Vanderburgh	6	181	6	195
Vermillion	4	62	5	67
Vigo	4	130	4	205
Wabash	5	129	5	234
Warren	5	85	5	60
Warrick	5	189	5	163
Washington	5	299	5	151
Wayne	5	265	5	420
Wells	5	416	5	466
White	5	117	4	65
Whitley	5	353	5	146
General average.....		269		250
General average		1897-8		272
General average.....		1896-7		232
General average.....		1895-6		272
General average.....		1894-5		118

EXPENDITURES.

The following is a classified statement of disbursements of the Institute fund for that portion of the year ending March 31, 1900, as taken from the books of the Superintendent of Institutes. The unexpended balance shown below will be used to defray the expenses of conducting the work during the rest of the fiscal year ending October 31, which expenses will include clerical work, postage, printing and stationery, traveling expenses of superintendent, etc.

Bills of chairman.....	\$2,178 24
Traveling expenses of speakers and superintendent...	1,023 09
Per diem of assigned speakers.....	1,361 39
Stenographic and other clerical work.....	217 50
Printing and stationery.....	48 80
Postage	71 00
Supplies	7 50
Telegrams, freight and express.....	10 07
Miscellaneous	1 35
Membership fee American Ass'n. Institute workers..	5 00
Unexpended balance May 1, 1900.....	76 06
	<hr/>
	\$5,000 00

CONFERENCE OF INSTITUTE WORKERS.

The Conference of Institute Workers held October 18-19, 1889, was a most profitable meeting and gave a very decided impetus to the institute work of the past season. The program of this meeting is given below:

PROGRAM.

WEDNESDAY, 10:30 A. M. E. A. MEITZGER, GRANGER, PRESIDING.

Music.

Prayer,Rev. W. D. Cole, Pastor Trinity M. E. Church.
Greeting.....Prest. J. H. Smart.

FARMERS' INSTITUTES:

Their value in promoting new industries.
Alex Johnson, Ft. Wayne.
How to make them most helpful to farmers,
Cal Husselman, Auburn.
Their need of increased State aid,
H. F. Mc Mahan, Fairfield.
General discussion. Announcements.

WEDNESDAY, 1:30 P. M. J. J. WHEELER, ROME, PRESIDING.

Music.

PUBLIC HIGHWAYS:

Their economic value to farmers.
J. J. W. Billingsley, Indianapolis.
Their importance to municipalities,
O. A. Somers, Kokomo.
State aid in highway improvement,
Otto Dorner, Milwaukee, Wis.,
Chm. Nat. Com. for Highway Impvt. L. A. W.
General discussion.

4:00 p. m. Informal conference. In charge of D. B. Johnson, Mooresville.

WEDNESDAY EVENING, 7:30. G. W. DORRELL, QUERCUS GROVE, PRESIDING.

EDUCATIONAL SESSION.

Music.....Purdue Mandolin Club.
How to make the rural schools most helpful to agriculture,
F. L. Jones, State Supt. Public Instruction, Indianapolis.
Discussion.....Led by D. F. Maish, Frankfort.
MusicMandolin Club.

What the Agricultural College and the farmers can do for each other,
 Eugene Davenport, Professor of Agricultural Univ. of Ill.
 General discussion.....Led by Milton Trusler, Connersville.
 MusicMandolin Club.

THURSDAY, 9:00 A. M. C. H. MORGAN, PRAIRIE CREEK, PRESIDING.

FEEDERS' SESSION.

Music.

Prayer.....Rev. H. T. Gary, Pastor First Presbyterian Church
 Music.

9:15. Informal conference, in charge of E. M. C. Hobbs, Salem.

10.00. Outlook for beef cattle in Indiana,

S. K. Barrett, buyer for Kingan & Co., Indianapolis

Silage in beef making.....J. A. Parker, Terre Haute.

John Grabner, Warsaw.

Feeding problems, Professor W. A. Henry, Director Exp. Station
 Madison, Wis.

Questions and discussion.

THURSDAY, 1:30 P. M. MRS. W. L. BERRYMAN, TIPTON, PRESIDING.

WOMAN'S SESSION.

1:30. Informal conference, in charge of Mrs. J. W. Bates, Broad Ripple.
 Music.

2:00. Needs of the farmer's wife and daughter,

Mrs. Mary A. Mayo, Battle Creek, Mich

Industrial education for women,

Mrs. Nellie S. Kedzie, Prof. of Domestic Econ.,

Bradley Pol. Inst. Peoria, Ill

General discussion.

Music.

Resolutions.

Adjournment.

TOPICS SUGGESTED FOR INFORMAL CONFERENCES.

Local organization. Independent institutes. Special sessions. Woman's sessions. Young folks' sessions. Choice of officers. Selection of workers. Assigning speakers on the program. Subjects for day sessions. Subjects for night sessions. Topics for assigned speakers. Topics for home workers. Advertising the institute. Place of institute. Securing co-operation of farmers, of business men, of the press. Needs of the local city. Plans for practical work.

The papers and discussions presented at the conference were highly interesting, instructive and profitable. A most intelligent and earnest interest was manifested by all present. A special interest was manifested in the Educational, Feeder's and Woman's Sessions, and many expressed a desire that the Conference of Institute Workers might become a regular feature of the work. The following is a list of the counties represented and names of delegates in attendance:

COUNTIES REPRESENTED AND DELEGATES ATTENDING.

<i>Count'y.</i>	<i>Delegate.</i>	<i>Address.</i>
Allen	Alex. Johnson	Fort Wayne.
Benita	Andrew Titsworth	Oxford.
Boone	J. C. Jacques	Thorntown.
	J. M. Knox	Lebanon.
	R. J. Riner	Advance.
	L. W. Jacques	Elizaville.
	James Riley	Thorntown.
Brown	H. B. Miller	Nashville.
Carroll	Chas. Buckley	Delphi.
	Mrs. Jennie Buckley	Delphi.
	Mrs. J. W. Holmes	Delphi.
	T. E. Fouts	Deer Creek.
	George T. Guard	Camden.
Cass	I. N. Cash	Logansport.
	J. S. Kline	Logansport.
	J. H. Barnhart	Logansport.
	B. A. Penn	Logansport.
	B. F. Campbell	Logansport.
	R. H. Barnett	Logansport.
	L. B. Custer	Logansport.
	Cott Barnett	Logansport.
Clark	A. H. Collings	Underwood.
Clinton	S. P. Bryan	Mulberry.
	A. W. Peter	Mulberry.
	Mrs. A. W. Peter	Mulberry.
	D. F. Maish	Frankfort.
Davies	Thomas S. Wirt	Oden.
Dearborn	H. L. Nowlin	Guilford.
	G. W. Sawdon	Aurora.

COUNTIES REPRESENTED AND DELEGATES ATTENDING—Cont.

<i>County.</i>	<i>Delegate.</i>	<i>Address.</i>
Decatur	B. F. Gaston	Sardinia.
Dekalb	Cal. Husselman	Auburn.
	Mrs. Cal. Husselman	Auburn.
Delaware	D. I. Duncan	Selma.
Elkhart	W. S. Smith	Middlebury.
	Mrs. A. W. Banta	Benton.
	Mrs. Hester Leacock	Benton.
	J. Scrannage	Goshen.
Fayette	Milton Trussler	Connersville.
Floyd	J. Stilger	Edwardsville.
Fountain	C. R. McKinney	Wingate.
	Wm. Kreusch	Covington.
	R. J. Miller	Covington.
	E. W. Martin	Covington.
	A. P. Burnside	Covington.
	Schuyler LaTourette	Covington.
	Mrs. Kate LaTourette	Covington.
	J. R. DeHaven	Covington.
	Ross DeHaven	Covington.
	Frank Dice	Covington.
	F. W. Bodine	Covington.
	Mrs. F. W. Bodine	Covington.
Grant	I. M. Miller	Upland.
	J. Strange	Arcana.
Hamilton.	T. E. Bowles.	Noblesville.
Harrison	J. S. Pfrimmer.	Breckenridge.
Hendricks	E. B. Davis	Careersburg.
	M. C. Ensminger.	Danville.
Henry	R. C. Morgan	Knightstown.
Howard	O. A. Summers.	Kokomo.
Huntington	E. F. Shock	Huntington.
	B. F. Billiter	Huntington.
	W. N. Billiter	Huntington.
	J. W. Brown	Mt. Etna.
	Jonas Brown.	Warren.
	J. W. Beard	Warren.
	Wm. R. Ridgeway	New Holland.
	Mrs. Wm. Thorn	Huntington.
	Wm. Thorn	Huntington.
	Mrs. O. Kline	Huntington.

COUNTIES REPRESENTED AND DELEGATES ATTENDING—Cont.

<i>County.</i>	<i>Delegate.</i>	<i>Address.</i>
Jasper	J. E. Alter.	Rensselaer.
	Mrs. Hattie Alter	Rensselaer.
Jay	C. S. Beck	Westchester.
Jennings	M. Schum	St. Ann.
Johnson	Chas. A. Dungan.	Franklin.
	W. V. King	Franklin.
	John Tilson	Franklin.
	M. R. Tilson	Franklin.
Kosciusko	John Grabner	Warsaw.
Lagrange	L. E. Deal.	Plato.
Lake	C. B. Benjamin.	Leroy
Lawrence	H. H. Edwards.	Bedford
Madison	W. H. Thornburgh.	Gilman.
Marion	S. K. Barrett.	Indianapolis
	J. L. Kingsbury	Indianapolis.
	J. J. W. Billingsley.	Indianapolis.
	Mrs. J. W. Bates	Broad Ripple.
Monroe	J. T. Eller	Bloomington.
	Mrs. J. T. Eller	Bloomington.
Montgomery	J. S. Fullenwider.	Brown's Valley.
	J. M. Harshbarger	Ladoga.
Morgan.	D. B. Johnson	Mooreville.
Noble	Wm. Talbert.	Albion.
	A. H. King	Avilla.
Orange	E. T. Winn	Rising Sun.
Parke	J. C. Swain	Marshall.
Perry.	J. J. Wheeler	Rome.
Porter	A. B. Lantz	Hurlburt.
	F. A. White	Valparaiso.
	Mrs. L. H. Robbins.	McCool.
Putnam	O. F. Lane.	Bainbridge.
	H. M. Randall.	Greencastle.
	Mrs. Amanda Randall	Greencastle.
Rush	E. A. Frazee	Orange.
	W. A. Alexander.	Rushville.
Scott	J. H. McCullough	Scottsburg.
	C. L. Mace.	Blocher.
Shelby	A. W. Tindall	Wilson.
Spencer.	Mrs. C. M. Thomas	Rockport.

COUNTIES REPRESENTED AND DELEGATES ATTENDING—Cont.

<i>County.</i>	<i>Delegate.</i>	<i>Address.</i>
St. Joseph	E. A. Metzger	Granger.
Sullivan	James Dodd	Graysville.
Switzerland	G. W. Dorrell	Quercus Grove
	Mrs. G. W. Dorrell	Quercus Grove.
Tippecanoe	G. C. Leaming	Romney.
	John Calicott	Lafayette.
	G. H. Hull	Lafayette.
	W. F. Bryan	Lafayette.
	Mrs. W. F. Bryan	Lafayette.
	Asa Markle	Lafayette.
	Mrs. Asa Markle	Lafayette.
	G. M. Blackstock	Lafayette.
	Mrs. M. W. Earl	Lafayette.
	Mrs. S. A. Earl	Lafayette.
	Miss J. L. Booth	Lafayette.
	S. C. Curtis	Lafayette.
	J. W. Smith	Montmorenci.
	Mrs. J. W. Smith	Montmorenci.
Tipton	John R. Nash	Tipton.
	Mrs. W. G. Nash	Tipton.
	Mrs. W. L. Berryman	Tipton.
Union	H. F. McMahan	Fairfield.
Vanderburgh	Albert Kamp	Cypress.
Vigo	Roxie Miller	Pimento.
	Grace Sparks	Pimento.
	D. B. Miller	Pimento.
	C. H. Morgan	Pimento.
	Harlie Miller	Pimento.
Wabash	Mrs. Kate M. Busick	Wabash.
	G. M. Naber	Treaty.
Warren	J. C. Goodwine	West Lebanon.
	H. B. Flesher	West Lebanon.
	T. J. Farden	West Lebanon.
	Mrs. T. J. Farden	West Lebanon.
	W. H. Goodwine	West Lebanon.
	Mrs. W. H. Goodwine	West Lebanon.
	T. C. Fleming	West Lebanon.
	Mrs. T. C. Fleming	West Lebanon.
Warrick	N. P. Hines	Boonville.

COUNTIES REPRESENTED AND DELEGATES ATTENDING—Cont.

<i>County.</i>	<i>Delegate.</i>	<i>Address.</i>
Washington	William Jack	Martinsburg.
	E. M. C. Hobbs.	Salem.
Wayne	John Macy	Hagerstown.
Wells	George W. Colton	Bluffton.
	A. A. Waugh	Murray.
White	Samuel Ball.	Monon.
	U. S. Hussey.	Monon.
Whitley	John Deitrich	Larwill.
	Mrs. Anna Deitrich.	Larwill.

RESOLUTIONS PASSED BY THE CONFERENCE.

The following resolutions were read and adopted at the closing session of the Conference of Institute Workers:

Resolved, That this Conference of Farmers' Institute Officers and Workers would respectfully make the following suggestions to the legislature of Indiana:

The success already achieved by the farmers' institutes of the State under the very limited support that they have so far received, justifies us in asking that the work be largely extended so that the departments of agriculture, which need special stimulus in various parts of the State, should receive it, and that the superintendent should be enabled to devote his whole time to the work. To this end the appropriation should be made not less than ten thousand dollars (\$10,000) annually,

Resolved, That we recommend the work of the agricultural college at Purdue and advise additional equipment and facilities. We would respectfully urge that the department ought to be supported in a manner consistent with the position of Indiana among the leading agricultural States. We would suggest that a liberal appropriation be made by the next session of the legislature to erect a building in keeping with the other institutions of the university which adorn the Purdue campus. In no other way can the agricultural college enjoy its proper dignified position as a leading institution of learning in a great agricultural State.

We would also suggest the desirability of a school of domestic science as we would claim as much consideration for the interests of our daughters as of our sons.

We gratefully tender our thanks to the president and faculty of Purdue university for their hospitality on this occasion.

PAPERS OF LOCAL INSTITUTE WORKERS.

Much of the success of the institute work is due to the papers of local workers read at the several institutes throughout the State.

Through the courtesy of the State Board of Agriculture, several of these papers are published in the year book of that body in connection with this report. These papers which have been sent in by the county chairmen are published without alteration or abridgment. It is hoped that they may prove helpful to many farmers and other institute workers.

THE WORK AND ITS NEEDS.

We have now completed eleven years of institute work under the law which was approved March 9, 1889. Although the Institute Act contemplates the holding of an annual institute in each county every year, it was found impossible to accomplish this at first. Two years were taken, therefore, to organize the several counties of the State and a little more than \$5,000 was expended in this work during these two years. Since that time \$5,000 has been expended annually in the institute work. Those counties which did not exhaust the direct apportionment on the annual institute were permitted to hold extra institutes under regulations provided, described by the superintendent.

The following is a summary of the number of institutes held each year under State auspices since the work began.

<i>Year.</i>	<i>Annual Institutes.</i>	<i>Extra Institutes.</i>	<i>Total Number Institutes.</i>
1889-90.....	50	0	50
1890-91.....	41	0	41
1891-92.....	90	12	102
1892-93.....	89	6	95
1893-94.....	92	3	95
1894-95.....	92	5	97
1895-96.....	92	11	103
1896-97.....	92	12	104
1897-98.....	92	16	108
1898-99.....	92	9	101
1899-1900.....	92	*11	103

The above table takes no account of the independent institutes which are being held in increasing numbers from year to year. The exact number of these is not known, as the local officers are not required to report these meetings. Forty-five such meetings were reported for the current year. This makes a grand total, for the year just closed, of 149, as previously stated. This, in view of the quality of the work done, without doubt makes the closing year the banner one in institute work.

*One county held two, making a total of twelve extra institutes.

No boom methods on the part of either the general or local management have been employed, and as a result the growth of the institute work has been steady and healthy, though not rapid. That the work has steadily grown in the public estimation from the start will be admitted, I think, by intelligent, fair-minded men. Increasing numbers of thoughtful, intelligent, progressive farmers are rallying to the support of the work, and it is gratifying to note that in a large majority of the counties of the State the local officers have shown a highly commendable spirit and generosity in the time and labor they have gratuitously given to the institute work.

There is a growing recognition of the need of increased financial support in order that the institute work may be in the highest possible degree helpful to the farmers of the State. The present appropriation is practically all absorbed in holding annual meetings in each county of the State. This leaves no funds with which to hold district meetings, special in character and particularly adapted to the needs of localities especially suited to certain lines of agriculture. In sections of the State questions of dairying, fruit culture, apple growing, forestry, drainage, highway improvement, disease of plants and animals, principles of feeding, methods of cropping, the use and application of fertilizers, etc., are of paramount importance. The question or questions of chief interest to a given locality could be taken up in a district meeting at a time of the year when the largest possible number of people could attend. If such meetings could be addressed by specialists of national reputation, a new impetus could be given to those industries for which the locality is especially fitted. To do this work successfully would require men who have been signally successful and who have achieved national reputation, as these only would arrest the attention and enlist the support of the people generally.

The resolutions passed by the Institute Conferences of 1898 and 1899 favor an increased appropriation for the institute work and a majority of the counties, without solicitation, have, from time to time, passed similar resolutions. It is earnestly believed that an increased appropriation for farmers' institutes would prove a very wise investment, as it would add materially to the State's resources and to its productive capacity.

The undersigned highly appreciates the pleasant relations that have been maintained during the year between the general and local managements. The spirit of friendliness and co-operation has been well-nigh unanimous. Much of the success of the work has been due, as in previous years, to the valuable assistance of the railway companies in granting special rates to the institute workers, to the courtesies and active co-operation of the press, and the cordial attitude of the people of the State.

W. C. LATTA,

Superintendent Farmers' Institute.

Purdue University, Lafayette, Ind., May 1, 1900.

CATTLE FOR THE FARM.

MAURICE DOUGLAS, SULPHUR HILL.

[Read before the Shelby County Farmers' Institute.]

In considering this question, we must consider what is meant by the word "farmer." A western farmer says "a farmer is one who tills the soil," and that "an agriculturist is one who sits on the shady side of the house and watches the crops grow, and who owns a \$700 cow." But the farmer we shall consider is the man who works with brain and muscle, for the man who is continually sitting on the keg at the grocery and who does not exercise his brain toward the betterment of his condition outside of the grocery, is not a farmer in any sense of the word, and all the wisdom of Solomon would not reach him on the farm.

I do not believe in "luck." The lucky man always knows where to sit, so that the "god of fortune," as she passes by, may easily touch him with her magic hand. We make our own luck; try it.

The farmer occupies a position that but few appreciate. He is face to face with nature on the one hand, on the other with the world. He occupies a position that no one else can fill. The kings and queens of Europe are such in name only—the formal part being theirs, the business being easily done without them, theirs only to settle marriages between themselves; the farmer really governs a greater realm. He is king because he feeds the world.

In feeding the world great problems come to him for solution. Position, location and transportation all are important features that must be weighed and balanced. We have dairymen probably with us, and with all due regard to the business, I believe all will say that the average farmer is not equipped with necessary articles, and that we are not in the proper position for an exclusive dairy country. If this country, with all of its richness and greatness should be turned into a dairy farm, I only have to refer to the one fact, that the outlet for dairy products can not compare with the outlet for the beef product. With a great foreign trade, with 75,000,000 of our own to feed with the staff of life, as it were, there can be no serious discussion as to the kind of cattle for the farmer—they are beef cattle.

This is all aside from sentiment. Sentiment is all right for those who can afford it but what the farmer wants is the mortgage-lifter and the farm-builder—something that will put money in his pocket and his farm in a better state of cultivation. If you want further proof of this fact we can back it with proof in an arithmetical way; but I venture to say that this can be proven with the eye. You can prove it yourself in your

own neighborhood. The man—the farmer, I mean—who has made money through the low prices, is the man who held on to the beef cattle.

But the question to all of you now is, What kind? I feel that you are fully convinced, not by us, but by the markets, as to beef cattle being the mortgage-lifter for the common farmer. I shall take it for granted that every man knows enough about the laws of supply and demand to feed his own crops at home, and haul as little away as possible. I shall not find fault with the different breeds of cattle, and I trust you will agree with me in saying that the beef cattle for the farmer to raise is the good one. When we consider that the difference between the poor cattle, or even the fair to good, there can be no discussion as to the fact, you, who have fed cattle, know that the poor cow will consume even more than the good one, while the returns are not one-half. There was a day, perhaps, when nature, driven into a corner, tried to remedy the lack of shelter by having the poor cow's back so sharp that the raindrops descending from heaven, were riven asunder by the razor-like backbone. But there can be no excuse for a cow of this kind—that day is past. Only with broad-backed cows—having plenty of constitution—the farmer of to-day can feed the people who depend on him for the dainty supply. Perhaps a discussion of what comprises a good beef animal would be worth the space. This is only my opinion, yet I think all lovers and judges will agree with me in the essential features:

First of all, the average farmer and his wife should look well to the disposition—unless other qualities are out of proportion the disposition of an animal is worth considering. Probably the only place for the spoiled cow is in the other man's stable, yet this is a matter of mere selection and cultivation followed through several generations. The head should be wide, muzzle not too long, as this is almost a sure criterion of the disposition; neck should be short and well set on shoulders; shoulders wide, great width between fore legs and well filled in behind the shoulders—a very important feature, as the constitution of the cow depends upon this development. There must be room for the heart and lungs, and the meat, deep and well placed on crop and in fore flanks, is not to be dispised by the butchers. The ribs should be well sprung to give plenty of room for the healthy stomach. Then again, the ribs should be well covered and even the poor cow not be just under the skin. Then again, there should always be a great development of the loin, for there is the higher priced meat. Also the general conformation of the back should be pleasurable to the eye—straight, broad and level, the tail-head not too low or not too—well covered, yet not surrounded with lumps of fat. The hind leg should be straight, not scythe-shape. The flanks should be well let down so that it is almost in a straight line from the front flank, and in well-fatted animals should be very thick. Then again, the animal should be well filled in the wrist, and have hams that are more than name only, and meat down to the hocks. As legs are not needed for running purposes espe-

cially, get them as short as possible. Then again, the animal should be thick meated and early maturing, but rest assured the animal if it possesses these other qualities will be early maturing. The hide should be loose and mellow and when an animal of the above proportions is in condition, the skin is soft and mellow. The coat of hair should be soft as a lady's glove, even though long.

Along with these qualities there should be a full development of the milking qualities. I can not vouch for all the breeds of beef cattle, yet think I am fairly safe in saying all of them will rear their own young well. The Shorthorns we know will meet the dairy breeds on the farm as the best dairy cow outside of the beef qualities, and probably the other breeds can say as much. But the great development of the dairy qualities is not the object to be obtained; yet, when it can be obtained, is a very desirable quality.

The dam of the winning yearling heifer over all beef breeds at the Minnesota State Fair is one of the best milkers we ever saw of any breed. But the primary object is the production of beef. Of course the housewife looks with pride at the golden pounds of butter, yet from a financial standpoint more money can be made in the production of baby beef without all of the hard work attending the making of butter. We mean not only money, but clear money. If the people of Shelby County had been raising fairly good cattle even, how much better would be the financial condition. Every farmer should keep a few good cows and not sell their young to the butchers but give them the best possible chance, and they will surely make money for their owners.

If a calf is doing nicely on one-half the cow's milk, it will surely do much better on all. A calf can be easily carried along, gaining 100 pounds per month, and at the end of twelve or eighteen months may be sold at a good profit. At the least calculation they should bring \$50 apiece. Almost any renter could have enough to keep six of these calves and thus have \$300 at the end of a year; and how many do? I can point you to a few examples which are within the reach of all. Not a thing was used except products grown on any farm. I saw a calf, also saw it weighed, and at eight months weighed 815 pounds. The next month the calf was fed corn bran and pumpkin and given its mother's milk and gained 140 pounds. At 5 cents per pound this would be worth \$7. With a few such calves a farmer could easily make \$1 per day feeding them clear of all expenses.

Above all things there is one rule that is always worth leading: "What is worth doing is worth doing well." Some say that only a favored few can make a success. But that one sentence tells the secret of raising beef cattle. Carry this into the selection of your herd; compare and have reasons for your own selections. I believe all of you can think of a time when a very few dollars, judiciously expended, would have placed you on a higher plane of beef production. Keep in mind that the "best is none too good" for you, and endeavor to attain it.

Of course, I believe the Shorthorns are the best cattle and every man is allowed his own opinion, and we honor the men who to-day are standing up for the other breeds.

In the matter of hornless cattle, if the animal is not sacrificed to get rid of the horns there is probably an advantage. But many times the beef animal is sacrificed and a much inferior animal is taken instead. In beef-cattle breeders there are two pioneers in our own county. Mr. T. A. Cotton & Son, near Manilla, have for many years held up the banner of red, white and roan, and your own Charley Amsdem has a choice herd of Herefords. No day could be more profitably spent than in a friendly comparison of the beef cattle of Shelby County. I am sure you are all welcome at the homes of any of the breeders, and we ourselves stand ready to show you that the Shorthorns will equal any beef breed that walks on the face of God's green earth. They will not only equal the beef breeds, but will rival the dairy breeds in milking qualities. In the market they stand the rival of any breed and have topped the markets more times than any other breed. Their disposition is perfect, and when it comes to a thing of beauty they are the neatest and the prettiest animal of the bovine race.

POULTRY RAISING.

MRS. C. M. THOMAS, ROCKPORT.

[Read before the Crawford County Farmers' Institute.]

"An ounce of prevention is worth a pound of cure," as a banner hung upon the poultry house wall, than which there is no better motto. There is no place where cleanliness tells with greater force than in the poultry yard. Keep the house clean and well sprinkled with air-slacked lime, the troughs well washed and filled with fresh water, the roosting places dry and free from draughts, and you may feel reasonably sure of healthy poultry. Vermin are the greatest pests with which all poultry raisers must contend. My poultry house is lined with tarred paper. It is warm in winter, cool in summer and free from mites. The perches are easily lifted from where they lie on an inclined plane. These are carried out, thoroughly saturated with coal oil or whitewash, upon the first appearance of the insect pest.

Tubs or boxes on the ground under the bridge I find to be the most convenient nests. After each hatch carry out and burn nesting in the nest; it is then ready to be again used. Dusting each hen with Persian insect powder, preparing a kerosene emulsion for the bath of each fowl, is recommended, but is hardly practicable. Free access to road dust and wood ashes, for bath, is always a necessity.

Scaley legs—the name indicates the disease. The trouble is produced by very small insects and is contagious. Grease is death to insects. The pores of their skin act as their lungs; when they are clogged with grease the insect ceases to breathe. Use grease and sulphur well rubbed in, or coal oil poured on, and the fowl held so the oil runs under the scales. It is always well to separate a diseased fowl from the well ones, whatever the trouble.

Douglas Mixture is a standard tonic for fowls and but few breeders but have been benefited by its use. It is made by using one pound sulphate of iron, copperas and one ounce sulphuric acid in a gallon of water and using some two tablespoonfuls to a bucket of drinking water.

I have cured fowls of cholera, but it is tedious and laborious. Should it be taken in its incipency, and the fowl valuable, try curing. As a rule a hole in the ground for the sick fowl, a general cleaning up, scattering of lime, pans of dry bran put out, and in easy access to the fowls—especially in the spring when there is a change from dry to green food—will be good treatment for the trouble. Corn meal, coal oiled and moistened, I have found always worked a speedy cure when symptoms were first noticed. One thing will soon puzzle you and that is where that taste of coal oil comes from. One whose taste is sensitive will soon detect the odor in the cooked eggs or fowls. The same is true of fowls whose chief source of food supply is filth. The flesh and eggs, when fresh, taste and smell strong.

There are as many ways of doing anything as there are people who do it. For the sake of a variety of ways I copy this cholera remedy: Take pure pine tar, found at all drug stores and many groceries, and paint the entire inside of a common milk crock with about three tablespoonfuls of tar, keeping the crock filled with drinking water. This is one of the greatest cholera cures in existence. Red pepper in soft feed is also excellent, and a tablespoonful of pulverized copperas in two gallons of water set before them to drink as they thirst. A pill made from common bar soap given to the fowl three times a day is a grand remedy. It should be the size of a large hazelnut.

Roup in fowls is much the same as cold and sore throat in the human family. If taken in hand as soon as the eyes show the white froth often a little coal oil poured in the mouth and the fowl suddenly inverted will be all the treatment needed. I quote cure for roup: If the head is swollen, nostrils running, cleanse the nostrils and inject the following preparation: Spirits of camphor, half ounce; spirits of turpentine, half ounce; coal oil, one pint, bottle and shake before using. Also, bathe the head. A half teaspoonful internally is good. Continue this treatment morning and evening for two days or until the fowls commence to get better, and don't let them wade around in the fresh snow. Keep housed on stormy and very cold days. Use sewing machine oil can, placing the spout at each nostril of the sick fowl spurring the mixture into the nostrils.

My advice for crop bound is the hatchet. I have used castor oil and kneading the crop, but it is tedious and disgusting. I have also opened the crop, removed the sour, tough mass, cleansed all carefully with carbolized water, sewed up each opening separately and fed the fowl on soft food for days, and effected a cure. Once I found a pebble too large to pass from the craw, thus obstructing a passage way to the food. By carefully working it upwards and forcing it from the mouth the trouble was overcome. Crop bound or hard craw: Thrust a pill of ordinary hard soap, about the size of a large hazelnut, through the mouth into the craw and with the finger work the craw so as to soften its contents and start its secretions. Do not feed the fowl until its craw is relieved of its contents. Supply with charcoal, oyster shell and gravel, if possible. Also plenty of green food and chopped clover hay. About a teaspoonful of castor oil forced into the craw every two hours, working the craw with the fingers, until it is relieved, is an excellent remedy also. Hold the bill open so as to drop the oil down the throat. Twisted horse hairs inserted into the windpipe and then twisted rapidly and withdrawn bring out the gape worm.

THE VALUE OF SORGHUM AS A FORAGE CROP, AND HOW TO GET THE MOST OUT OF IT.

G. E. DINGTON, CLARK.

[Read before the Randolph County Farmers' Institute.]

In writing a paper on "Sorghum" we want to give Mr. Waldo F. Brown, of Oxford, Ohio, credit for our experimenting with sorghum. Mr. Brown gave a talk on this subject at our institute at Winchester, Ind., in January, 1896. On May 27, 1897, we harrowed out some of our corn and sowed one-fourth bushel of sorghum seed, and it did so well and produced so much feed that we were encouraged to try again, and on May 25, 1898, we sowed two bushels of seed, and from this crop we fed our cattle and hogs from some time in July until October. But the fall of 1898 was so wet that we lost about one-third of that crop. We think if we had that crop to harvest again we could save it all. It will stand more rain than any other crop we ever harvested. Part of this crop that we lost laid out in the field all winter, and the stalks were perfectly sound in the spring.

On May 20, 1899, we sowed two bushels of seed on about one acre of black land, and it produced a great crop. We fed twenty-four head of hogs and four head of cattle from July 15th until September 22d, and on this date took the team and mower and mowed what was left. We let

it lay in the swath about one week, then took the horse and rake and raked in small windrows, let it cure for one week more, then put in the mow and shock. We made large shocks and fed these from the field until November 12. It kept very nicely and the cattle and hogs ate it as well as when green.

In summer we feed morning and evening. We mow it with the scythe and throw over the fence with the fork. We feed very little until the stock get used to eating it, then feed all they will eat.

To test the feeding value of sorghum we put one cow in the stable in the month of August and fed sorghum alone, and she gained in flesh and gained on her milk. The milk is as rich as when produced from the best clover pasture.

THE SEEDBED.

The seedbed should be as fine as the seedbed for wheat, for clods will not grow sorghum any more than they will wheat. Any soil that will produce a crop of corn will produce a very good crop of sorghum. We believe one acre of good rich soil will produce ten tons of sorghum.

When we plow the land early we harrow often to keep down the weeds, and have the soil in fine condition for seeding.

WHEN SHOULD SORGHUM BE SOWN?

It should not be sown until the weather is warm and settled so as to get a start of the weeds. We would not sow broadcast until the middle or the last of May, for sorghum is slow to start to grow. When it is ten inches high it grows very rapidly. It can be sown the last of June and produce a good crop for winter. We prefer to sow broadcast instead of drilling with the wheat drill, for the seed is scattered all over the ground and keeps the weeds out better than when drilled. The seed should be harrowed two or three times to get it well covered.

HOW MUCH SEED TO ACRE?

For summer feeding for cattle we would sow two bushels to the acre; for winter feeding would sow at least two and one-half bushels to the acre, for the cattle eat the small stalks all up but do not eat all the large ones. The small stalks cure out better than the large ones. The shell is not so hard. We do not like to feed the large stalks to the cattle in the winter because of the hard shell. But for hogs it is better than the small ones, for the hogs chew stalks, get the juice and do not swallow the shell. The large stalks are very sweet and it is the sweet that gives it its great feeding value.

For hogs we would drill in rows three and one-half feet apart and ten stalks to the foot, cultivate the same as corn so as to grow large stalks for they are the sweetest and grow more seed.

We believe that the seed has a feeding value almost equal to corn. Cattle and hogs eat the seed first. Hogs fed sorghum, with a half feed of corn in the hot and dry summer months, will be healthier and do better than if fed all corn. In the summer and fall of 1899 we fed our hogs sorghum from July until November, with a half feed of corn, and never had hogs do better, and this was a very dry season.

We think one acre of sorghum is worth \$40. Some may doubt this, so I will give some figures:

Twenty-four head of hogs, at 30 cents per head per month for three months, would be \$21.60; four head of cattle at \$1.50 per head per month for three months would be \$18.60, which would be \$40.20.

January 1, 1900, we are feeding sorghum once a day to our brood sows, and they are doing fine, and are feeding sorghum and corn fodder to our cattle, and they eat the sorghum first.

We have not had much experience in feeding it to horses, only enough to know that they will eat it as well as the best clover hay.

THE TIME TO HARVEST SORGHUM.

We think September is the right month to cut it; it seems fully matured then. It should be cut before any heavy frosts come, for when frosted it is not so good for feeding. When the leaves turn brown at the bottom of the stalks this is a good sign that it is ready to cut. In the fall of 1899 we cut our sorghum on September 22d, and we saw by the Weekly Gazette that Mr. Brown cut his on the 21st, and he is authority on sorghum.

It does well in any kind of weather. It will stand more rain than any other crop we have ever grown. We think it will endure more drouth than any other crop that grows. The season of 1899 was very dry and our sorghum grew ten feet high. The man on the small farm can not afford to be without an acre of sorghum, for it will produce about four times as much feed as any other crop, and is ready to feed in the dry months of July, August and September when the pastures are all dried up. The man who thinks he has no land for sorghum, let him cut his clover in June, plow one acre of his clover sod and sow it to sorghum. He will be well paid for his labor. We have never sown sorghum in June, but know it will grow a good crop sown then, for that part of our crop that we cut the last of July and first of August made a second growth that was four to five feet high and made fine winter hay.

One might think sorghum an exhaustive crop on the soil, it makes such a quick growth, but we think not, for the second crop that we grew was grown on the land our first crop grew on and was as good as the first, and when sown to clover was the best stand in the field.

THRESHING THE SEED.

In Ohio they thresh it with the threshing machine, but in Randolph

County, Indiana, we thresh with the curry comb. In conclusion, will say that we have not words with which to express our good opinion of sorghum as a forage crop.

AN IDEAL FARMER'S GARDEN.

B. F. CRANE, ROB ROY.

[Read before the Fountain County Farmers' Institute.]

The subject assigned me to-day, "An Ideal Farmer's Garden," is of much more importance as an auxiliary to the farmer as a source of pleasure and profit than it is credited with by the average farmer. Many farmers look upon the garden as something unworthy of their time and attention; and, after turning a part of it over with the plow, they usually turn all of it over to the already overworked housewife, who, with a heavy heart, and a heavier hoe, is expected to raise the garden vegetables necessary to supply the table, and if she fails, her liege lord usually succeeds in raising "Cain."

But perhaps enough of pleasantries. Never, since the creation, when God placed Adam in the Garden of Eden to dress it and to keep it, has there been conferred upon man an avocation so conducive to happiness and pleasure as that which is derived from the labor and care of having charge of a well-regulated farm garden. Who of us that can not spend a few minutes occasionally with great pleasure in looking over our garden with some friends, inspecting the many varieties of fruits or vegetables and looking forward with great expectation on the result of an experiment with some new or novel variety of fruit or vegetable which our curiosity has prevailed on us to add to our list of garden products? While this is true with those who possess an ideal garden, yet it is a fact to be deplored that in passing along the highways and byways of our country that we see so many farm gardens that are only such in name. In reality they are a babel of confusion, consisting of a few old-time vegetables, promiscuously mixed with a few straggling, half-starved currants or gooseberry bushes, and intermixed with a good supply of crabgrass, butterprints and jimson, with a border of alders and perhaps a few raspberries or blackberries, each striving for the mastery of the situation, while many of the most luscious fruits and vegetables are conspicuous only by their absence. In using the term farm garden we wish to convey the idea of a garden containing an elaborate list of vegetables, together with small fruits and berries, and the location of such should be well considered.

Select, as convenient to the house as possible, ground with a little in-

cline to the south and east, as the morning sun will sooner have the desired effect of warming up and drying off the soil. Also, a wind-brake of orchard trees or buildings on the north and west will be beneficial if not too close. When very close they will damage by shade in the spring and by the reflex heat of the sun in dry weather. If the location is not naturally underdrained, make it so artificially. The size of garden must depend somewhat on the demands to be made upon it, but do not make it so large but what the space will all be well occupied.

In arranging or laying off, we should have an eye to beauty and symmetry as well as business. If it is not square, I would have it lengthwise north and south, that the rows be laid off in that direction, thereby giving the sun a better opportunity to impart heat and color to the fruit and vegetables.

Of course you will not scoop out large alleys and walks or throw the ground up into beds, thereby wasting a large portion of the ground, besides inviting disaster from drouth. By all means leave the entire plat as level as nature has made it.

Commence laying off by first leaving a strip of blue grass three or four feet wide along the fence. This should be clipped several times during the season to prevent seedling. Then in a long straight row two feet from the sod, plant such roots and bulbs as will remain in the ground through the winter and perhaps for several years, such as asparagus, horseradish, sage, rhubarb, and as many others as your fancy and taste may suggest. Next, in straight lines, laid off with your garden plow, plant your onions, radishes, lettuce, beets, parsnips, bunch beans and bunch peas, and any other vegetable of like nature, always leaving space according to the height attained by the plants and sufficient for tillage. Next to your small vegetables is a good place for a few rows of strawberries, which you will surely not think of leaving out.

A little comment here might be in place. How many families are there who are depriving themselves of this most delicious and healthy berry because they think it will take too much work and occupy too much ground to grow enough for family use, and whose conclusion is that they can better afford to buy of those who make a specialty of growing this berry than to bother with it themselves? The consequence is, their children never taste a strawberry unless while visiting a more fortunate family. The fact is, there is nothing within the pales of the garden more easy to grow than the strawberry. Occasionally frost or drouth may cut the crop short, but this is the exception and not the rule.

In our garden we have, from three rods of ground, picked seventy-five gallons of berries, besides those which found their way from the little hands to the red lips of several young Americans, who would daily leave the garden with a look of satisfaction, after filling their stomachs to repletion. Of course, you will have to start a few new rows occasionally and plow under the old, as they are liable to become too thick or foul with

bluegrass or white clover, consequently producing small and inferior berries. Next to your strawberries continue with straight rows, observing the same rule as to width, with such as carrots, salsify, cabbage, cauliflower, cole-rape, tomatoes, stick peas and pole beans, and as many others as the like and fancy of the family may suggest. Supposing you have occupied all the space you desire to with vegetables. Now plant a row of currants made up of such varieties as Red Cross, Fay's Prolific, Red Cherry, and White Cherry. One row will be a plenty if you will take care of them. Be sure to leave enough space on either side to cultivate and mulch. Next, a row of gooseberries—the Houghton and Downing and Keepsake will make a good variety of this fruit, to which the new industry might be added for curiosity. Now select about twenty of the leading varieties of grapes from the earliest to the latest, and what you can't set in a row across your garden you can use to make an arbor from your back porch to the garden gate. They will be convenient for the children to help themselves to. Next to your row of grapes you will want a few rows each of red, purple and blackcap raspberries. You may choose your own varieties, but I would suggest that you do not leave out "Shafer's Colossal," and "Gregg." Next to those you will want about as many rows of blackberries, and I will say for the "Snyder" and the "Erie" that you may rely upon them when others fail. We will suppose you have reached the other side of the garden, although we have not spoken of many vegetables and vines, such as sweet corn, sweet potatoes, Irish potatoes, cucumbers, watermelons, muskmelons and others. But as every farm should have a "truck patch" we consign them a place there; and the flowers, we will leave for a flowergarden and the front yard. Your garden is full. However, the planting is not all done the same day, or the same week, as some vegetables require to be planted much earlier than others while some should be planted at intervals to secure a succession of crops. We will suppose you are provided with a garden plow and attachments, a steel rake, a few insecticides and fungicides, a good spraying pump, and you are prepared for war in time of peace. As soon as there is a rain of any consequence, stir the ground thoroughly with the plow and level with the rake. Repeat the operation once a week, or after each heavy rain, and you will kill thousands of weeds before they get their heads above the surface of the soil. It is much easier to stir the entire surface of an ordinary sized garden before a weed is in sight than to weed out a few rows after they have become "sodded" with grass.

As the season passes be on your guard for the "enemy." The gooseberry and currant worm are the first to appear. Load your gun with a solution of white hellebore for them. For the cabbage worm use hellebore or kerosene emulsion. For mildew and grape rot use the famous Bordeaux mixture, while the raspberry sawfly can be most successfully fought by cutting out and burning the old canes as soon as the crop is gathered. As early vegetables mature and are used, see that the space they occupied

is planted at once with some other that is adapted to the latter part of the season. Where your peas grew you can grow several bushels of turnips, and don't forget to have a lot of nice celery plants to set as soon as you pull your onions. See that no vacant places are growing a crop of weeds to give you trouble next year, as it will require several years to exterminate the seeds of a single weed when worked in the soil by the action of the frost.

Finally, the success of our life depends very much on the energy we use in our efforts. Life is what we make it. Those with but little ambition seldom, if ever, attain to a degree of success above their aims, no matter what the profession may be.

Then let "eternal vigilance" be our watchword and a "time and place for everything" our motto, and the fruits of our labor will be such that will bring happiness and pleasure to those of our household and the applause and admiration of our neighbors.

And when our children have gone out from under the parental roof to engage in life's battles, they will ever cherish the memory of their youthful days as the brightest pages in their life's history.

CARE OF CREAM AND CHURNING.

MRS. JENNIE HILL, DUNLAPSVILLE.

[Read before the Union County Farmers' Institute.]

I do not think I shall be able to give you any new ideas on the subject assigned me. My audience is, as a matter of course, composed of farmers, with their wives and daughters, to whom butter making is a matter of everyday experience, and probably many of you have modes of procedure in the work better than I can suggest.

Even if you desire to learn better methods, my ideas are neither new nor original. Your agricultural papers are full of information, varied and useful, on this subject, and practical farmers and lecturers have gone over the ground again and again.

I can only tell you a few things I think I have learned by experience and observation. It was suggested that this would be a timely subject for discussion.

A considerable proportion of the milk produced in this country finds a market in the creamery, and much of the butter made on the farms is sold to customers in neighboring towns and cities, so in our own home town there is a scant supply of good dairy butter. Then the present advanced prices of good butter make a better outlook for the ordinary farm

dairy. These higher prices almost place creamery butter beyond the reach of the ordinary consumer. Would not an advanced excellence in the home dairy product shut out the butterine, so much dreaded by the dairyman? For this will be bought if there is no "happy medium" to be found between high-priced creamery and strong, greasy country butter.

For, to the credit of this much-abused article, be it said, it is far more palatable than some butter. And we must admit that somewhere butter, not acceptable to cultivated tastes, is manufactured.

The woman who is so unskilled in this branch of housewifery is probably not in this audience. I doubt if she could be found, self-confessed, in Union County. I think the manufacturer of the article in evidence in the grocer's cellar or ware room must live "across the line," or the butter must, like Topsy, "just growed" amid the dust and must and odors there. I have thought that the makers of some butter that I have seen must have given much thought to their work and have taken infinite pains to carry out their plannings—to be able to make that lardy, mottled, marbled, rancid compound from pure sweet milk or rich, fragrant cream.

There are some farmers' wives who lack conveniences for successful work in this line. But I think more frequently pure carelessness and the lack of a proper ambition to do one's best hinder success. The low price of butter for so many years made it seem not worth while to try to make a good article.

Butter makers need to be reminded over and over that "what is worth doings is worth doing well."

There is a fair amount of hard work about the making of good butter. From the time you drive the cow into the milking lot until the finished product is on the consumer's table, the work belongs on the prose side of farm life.

With certain environments the poetic may come in: There was a spring-house on a farm where I often visited in childhood that seemed to me the abode of restfulness and peace. A low, wooden building with projecting gable nestled at the foot of a hill, shaded by two giant beeches. The spring a deep, dark, pool, walled in with mossy limestone; a broad, low door opened into the milk room, the dark, cold water spread over the space within, only a broad slab to walk upon from door to opposite wall; the red crocks, each with its well scoured wooden cover, stood in prim rows in the water; a shelf held churn, bowl and ladle; a tray beneath was heaped with cubes of golden butter; a blue and white plate rested on one milk lid, ready with its "pat of butter" for supper, companion-piece to the low pitcher of yellow cream. On a shelf outside were ranged the empty jars, sweetening in the sun.

The summer birds sang in the beeches and the sunshine shimmered in the light and shade below.

Surely in such a place one could for a time forget toll and care and dream with the nymphs of the wood and fountain or sing with the birds.

Perhaps the prose came in with the skimming, emptying and washing of those heavy crocks. But she would surely be an apt artist in the spoiling of good material who could make bad butter with so many of nature's good gifts to help to good results.

But the problem in butter making is how to get the best with the least expenditure of time and labor. How to get the cream in good condition and how to care for it, keep in good state, and churn it after it is obtained.

The creamery solves this problem for those who are near enough to avail themselves of its aid. For the farmer five or ten miles distant there must be another way. If he keeps ten or more cows, has a prospect of a paying market, intends to increase his herd, keep in the business for several years, and can command the price of a good separator, he ought to buy one, and then he could, whatever the weather, get all the cream in perfect condition.

But let him not think that he can on busy days let the wife or children separate the milk. Turning a separator is work that takes stick-to-it-iveness and a good back. But for the owner of two, three or four cows who only wants good butter for his own table and some to sell to help meet grocery and dry goods bills, there is a better and an easier way than shallow setting in the old-fashioned pan. If you have a good spring near your house, nature has given you a fine beginning; you can easily arrange for deep setting, even if you do not care to put up a building. A tank deep enough to hold water sixteen or eighteen inches in depth, with a convenient cover, and a rough shelter from sun and storm, will do.

If there is no spring, the box can be placed at the well with good results. The cans we used in setting for many years were eighteen inches deep, eight and one-half in diameter, and holding about four gallons. In winter if you have only a tank at the well, some other arrangement must be made. An ordinary cellar is not a good place for milk; there are too too many odors in winter and too much of a tendency to mold in summer. Several of my neighbors have creameries which they use in buildings near their wells. These buildings are partly below ground and frost-proof.

The Polar creamery is convenient, and the Crystal is good, but not so easily kept clean. There is a so-called separator used by some of our neighbors that provides for deep setting in the open air. I know little about the practical work of this can, but think it possible it may meet a long-felt want. It certainly has the merits of simplicity and cheapness.

I think the secret of getting the cream from the milk in good condition is this: Rapid cooling of the milk in a pure atmosphere, and removal of the cream from the milk before it sours.

Good butter may be made from cream that is soured before skimming, but the chances are in favor of the cream that is skimmed sweet. All the cream rises before the milk sours if it rises at all; certainly none rises after souring. We skim in twenty-four hours after setting in winter, in six or twelve in summer.

We try to keep the cream sweet until the day before it is churned, and I think cream should never be more than four or five days old, even under the best conditions. The problem in winter is, how to get it soured. Keep it where it will not freeze, stirring well whenever fresh cream is added. The day before churning add a little skim milk, previously soured, to the cream. Then place the cream jar in a large vessel, fill the space between with hot water, not boiling, however, cover closely, but stir frequently until the cream is at a temperature of 75 degrees, then remove from the water and it will be in right condition by morning.

In summer churn as soon as possible after the cream sours. If you sour your cream in winter by your kitchen stove where the odors from cooking cabbage, turnips, and onions may mingle with it, or in the family sitting room which may be sleeping room and nursery as well; or if the cream boils and cooks in the jar from excessive heat; or if you keep it in summer until it wheys, or molds or bubbles from very sourness, do not expect nature to do violence to her laws by helping you make good butter.

We churn our cream at a temperature of 60 to 64 degrees, varying with the state of the atmosphere.

Every buttermaker should use a thermometer in her dairy, but I know many who do not.

In my early house-keeping days, I had great tribulation with my churn. I almost began to believe in the witches who are said to preside over the churn and soap kettle.

My cream made light, foamy stuff, which by courtesy we called butter, or else it foamed and ran over the top of the churn, and had to be warmed with boiling water, cooled with colder water, salted, sodaed and sometimes refused to come with all these remedies; or showed tiny beads of butter which stubbornly refused to gather.

My husband, more progressive than I, suggested the purchase of a thermometer. This idea I indignantly scouted, neither my mother nor his mother used one, I was sure I could tell by the touch if the cream was too hot or too cold. Then, besides these strong arguments, was sure I could not learn to use one if I had it.

He gently urged that he thought I was intelligent enough to learn its use; and in the end he purchased it, and was conveniently present next churning day to prove its merits.

I suppose the churn itself must be of the right kind. The old dash churn still does good work, but of course others are preferable. The rectangular, the barrel churn, or the swing churn are all good, built on the same principles—breaking of the globules of butter fat by concussion. We color our butter the year round, trying to have the color uniform winter and summer.

Of course, color in butter is a mere matter of taste. I prefer yellow for my table butter, just as I prefer to eat my meals from a table spread with a clean white cloth, and coloring matter in butter does not injure

the flavor; it is an oil tasteless and odorless. We use now Hansen's Danish Color, adding it to the cream when we begin churning.

We churn until the butter is in pellets like shot, do not gather it in a mass but draw off the buttermilk, throw in cold water, and, after standing awhile, draw off the water and remove butter to the worker. A lever butter worker is a great saver of time and muscle in dairy work, and I am sure one who has used one would not wish to return to bowl and ladle.

We do not work our butter as much as we once did; we use fine dairy salt easily dissolved, and avoid working after the butter becomes too warm and has a tendency to become oily. A little buttermilk is preferable to greasiness; butter that is worked too much will not "stand up" when July and August heat try it.

I think farmers would find it advantageous in many ways to put up ice. Several farmers could erect a building at some central point, and plenty of winter's free store of cold would lighten the labor of summer days and prove a source of profit.

THE HESSIAN FLY.

BERT HART, BOONVILLE.

[Read before the Warrick County Farmers' Institute.]

The Hessian fly is a small, dark-colored, two winged fly, about an eighth of an inch long. The female is larger than the male and somewhat resembles a small mosquito. The life of the adult is comparatively short, both dying shortly after performing their natural function.

Probably most of you have pulled up wheat plants to look for what is generally called the fly eggs and found small egg like objects, which are not the eggs, but the larvae. The eggs are very small, of a dull reddish color, and are laid upon the upper surface of the leaf.

The young larvae, soon after hatching, works its way down to the bud and there remains, absorbing the juice of the plant. This larvae, when first having worked its way down the stem of the plant, is, as most of you have no doubt observed, so small that it can scarcely be seen by the naked eye. It continues to grow, and some already this fall, as they did last fall, have changed to the flaxseed state, depending upon the time of oviposition.. The flaxseed state is a sort of a semi-pupa state, a half way between the true larvae and pupa. The later ones remain

through the winter as larvae. This causes the spring brood of adults to be spread over a considerable time.

The fall brood injures the wheat plant by absorbing the juices or substance of the plant, thus preventing it from stooling, but causing it to form a mass of leaves more of a dark blue than a dark green color, as a thrifty wheat plant would be.

If, after the fly has begun to work on the wheat, there should be a few days of hot dry weather, it begins to die, as without considerable moisture it can not withstand the destructive work done by the larvae.

Wheat, as do all other plants, fights against other plants and parasites for its existence, and, if the moisture and plant foods are sufficient for a thrifty growth, it begins to stool in spite of its struggle with the fly.

The spring brood works in a similar manner as does the fall brood, but generally a little higher up the stem, thus causing the stem to decay and break over before harvest.

The insect remains as larvae in the stubble after the grain is cut, and the fly begins to appear again about the last of August, and in some localities all through September and even into October.

The entomologists who have studied the nature and work of this fly, as to its relation to various plants, say that it confines its oviposition almost wholly to the wheat plant and that the eggs when deposited on any other plant than the wheat plant will not propagate. In other words, the larvae can not live on any other plant than the wheat plant. If any of you were so fortunate as to have a little rye in your seed wheat fall before last, you observed, when cutting, how well the rye did while the wheat was hardly worth cutting. The same was true of the oat crop—unmolested by the fly.

If this be true that the Hessian fly confines its oviposition to the wheat plant and that it can propagate only on this plant, then, if every farmer should not be quite so hasty about sowing and wait until he is confident that it is too late for this little pest to get in its work in the fall, then its eggs will be left in no plant on which it can propagate, thus there will be no spring crop, while on the other hand, if one farmer sows too early and catches the fall crop, he will seed the whole community for the spring.

It matters not how cold the winter gets; it doesn't have any effect upon the larvae, so there is no doubt if they appear in the fall but what we will have them in the spring.

Entomologists say that the Hessian flies usually go in cycles—a few years on and a few years off. It is a fact that there is a parasite that destroys these flies, and from all probabilities another year these flies will mostly be killed, as usually the second year the parasites begin to get in their valuable work for the farmer.

As preventive measures, I would mention later sowing, especially on the part of our early sowers, burning the stubble where it is practicable,

rotation of crops, apply quick acting fertilizers to encourage a quick, vigorous growth. I can think of no remedy for the spring crop. Perhaps the most important point in the whole matter is a better system of farming along the whole line, which includes rotation of crops and co-operation of all farmers in all matters of this character which affects the general welfare of our community.

HOW TO AVOID COMPETITION.

MISS ORPHA CAMPBELL, BEAN BLOSSOM.

[Read before the Brown County Farmers' Institute.]

The wide-awake, up-to-date fruit grower is the busiest person in the world. There is always something to be done and this something must be done at the proper time and in the proper manner or there is certain to be a loss in some way.

After the crops are gathered, there is still plenty of work in preparing land, trees and plants for next season's crops. He must look back and review his past season's work that he might be able to avoid any mistake, and profit by his success.

And, if he is intending to enlarge his orchard, he should be looking after the best varieties, and look up the newest sorts, and learn if they are adapted to his soil, climate and market.

At best, the fruit grower must take many chances. He must try new things. Some will prove good and many will be worthless for him, while the same varieties that are worthless for him will be best adapted to some other locality. The fruit grower who experiments with these sorts of fruits is certainly a public benefactor.

It costs money and time to learn what varieties are adapted to certain localities. And yet how few people stop to think of it.

Suppose A is intending to plant a large apple orchard and knows little or nothing of varieties. B has been growing apples for years, has bought and paid dearly for learning the varieties best adapted to his soil and climate, which is the same as A's. Now, A goes to B; after asking a hundred and one questions, noting down in his note-book the names of all the best varieties and probably using up half of B's valuable time, goes home after, perhaps, thanking B for his trouble. Now, the point which I wish to make is this: Should B go to A and ask one-tenth the questions or take one-tenth the time he hindered B, he would have charged him well for it, and he would have expected to pay well for it. I am certain A

would have made some serious mistakes in his selection of varieties if he had used his own judgment; maybe some would ripen in his country and maybe some would not. And it is therefore by one's own experiments or consulting growers in their own neighborhood, that one can learn as to the best varieties, and I am sure you can always find them accommodating and ready to give any information in their power.

There is a large and ever increasing demand for well grown fruit, and while we can not grow all kinds, we can grow the Minkler here to perfection, and the Ben Davis. Why so much opposition to the Ben Davis? It seems silly continually to talk against our interests. The trees are hardy, and early bearers, and find a ready market at a good price. Anything that finds a ready market at a good price can hardly be called worthless. There are several other kinds less well known which may succeed in some localities, but for planting for commercial purposes, it is not desirable to have too many kinds.

First, by selecting varieties, choosing those that ripen at a season when the market is less likely to be glutted; or by choosing those which show a tendency to annual bearing, and managing them so as to develop this tendency in the highest possible degree; or by choosing those that have a combination of beauty and high quality, that may make them profitable where special markets for them may be found.

It is a harmless amusement even if there were no resulting benefits, but when the results are taken into account I wonder why more do not occupy their leisure time in cultivating a bit of ground. There is special amusement in growing.

If you have a bit of ground and a few moments to spare daily through the growing season, plant something to watch and study; it will broaden your horizon and lead you into new line of thought, even if it is only a currant or gooseberry bush.

This is a striking illustration of the adage: "Where there is a will there is a way."

BUSINESS METHODS OF FARMING.

GEORGE HARTLE, OSSIAN.

[Read before the Wells County Farmers' Institute.]

This is a subject that all farmers should study, seeking for all the means within their reach. Good farm papers give much instruction, yet some correspondents are mistaken; however, not near the majority of them. Many of them give us much information. All farmers should take two of the best farm papers. If carefully read they will pay largely for their subscription.

Another way of learning business methods in farming is to converse with the successful farmers who have followed the business for a number of years and have increased in farm knowledge and property. Such one can give good instruction. Don't take information from such as have reduced the fertility of their soil and worked themselves into hard financial circumstances.

Keep within means. If means are large, be expensive, yet only in the way that will add convenience. Fine appearance and prosperity will be a help to others, giving them a view of wisdom and respectability. In putting up buildings on a farm, always make a close estimate of what you can afford in cash outlay.

Indebtedness, with paying interest by a farmer, is a serious thing, unless he knows that in a short time the cash will be in hand to liquidate it.

Drainage is a necessity on most or all farms in this vicinity. If the work in that line is done it ought to be well done, with a reasonable depth, good tile, and properly put in. The tile must be below hard freezing, with a good outlet.

Some ditches are perfect in their work, others need careful watching. Any one who has lost much by trusting the ditches is taught to be watchful.

Quality of soil has to be estimated as carefully as business in any other thing. You till thin soil very long, the whole proceeds will scarcely pay for the labor; sometimes will not half pay for the work. If such soil is grassed and fertilized it will become productive. My plan of fertilizing such ground is to pasture it, mostly with sheep, which I consider the best stock to fertilize ground. Their income will make a good rentage for the ground, and will be adding value to the soil. Grass, which is pastured so as not to ripen, and not eaten too close to the ground, will draw fertility from the air, adding it to the soil. High land treated that way for a number of years will produce as much corn as the rich soil, but if all fertility is drawn out, it is like deposited money—when all is out nothing can be drawn until more is deposited, and it takes much effort and expense to make a valuable deposit.

Working the soil requires judgment and carefulness. It will not do to plow or cultivate it when too wet. The depth of plowing depends upon the quality of the soils. In raising corn the soil is needed to be in a good condition, that is well granulated to the depth of the plowing, after which the cultivation should be shallow, keeping the ground from cracking in warm weather; also preventing the injury to the roots. Weeds should be kept off the soil. The best corn should be selected for seed, and planted in the proper time. Conditions of the weather varies the date of planting. Farmers need good judgment to determine when the crop should be planted. This remark refers to all crops. The feeding of corn to good stock is usually more remunerative than the selling of it. The feeding

retains fertility on the farm, the taking of it off the farm is transferring fertility to some other place.

On a moderately rich field the farming should be as follows: First, a crop of corn; second, oats; third, wheat; then grass for fertilization. If pastured it fertilizes the soil; if ripened and mowed and taken off, it does not. Growing grass draws fertility from the air and receives fertility from the animals that are pastured on it. Sheep are a good class to be pastured on it, being profitable, and adding fertility to the soil. Best results when not pastured too close. Good and valuable stock consumes no more than the cheap and worthless stock. Farmers, let us get and keep the best stock possible, finding out, as best we can, what will pay us the most, then feed well, protecting them from severe weather and bad storms.

Farmers' education should consist of enough literary education to enable them to keep good accounts of their business, and to thoroughly study the practice of farming.

We all realize the great benefit of being mathematic calculators. One hundred dollars safely put on interest at 6 per cent., when a young man is twenty-two years old, and compound yearly until the man becomes seventy years old, he will have sixteen hundred dollars, providing he had spent none of the money. This teaches us farmers to save and safely invest some of our early earnings, so that old age will have something to live upon.

WHAT A WOMAN CAN DO ON A FARM.

MISS NELLE MURRAY, CONNERSVILLE.

[Read before the Fayette County Farmers' Institute.]

What can a woman do on a farm? What would a farm be without a woman? Some of our best farms are managed by women.

There is nothing in comparison with the love of a devoted wife; joy, peace and happiness are found within the precincts of home. When the day, with its cares and duties, its burdens and trials, is past, how sweet to have some little quiet spot to which we can flee, and find a balm for all our cares and troubles; to have, amidst the bustle and turmoil of life, a dear wife, to whom we can unbosom ourselves and obtain the tranquil happiness that the weary minds of men so much need.

Then how useful she can be toward earning something to help along. A woman in the southern part of the State cultivates a farm of 180 acres. Her husband was sent to the penitentiary for twenty years. This poor woman has a family of seven small children to support, the eldest being

a girl of fifteen. She determined to stay on the farm and raise the crops herself. She has husked eighty acres of corn this fall, and has a very promising wheat crop. She is feeding 150 head of hogs and takes care of quite a number of horses and cows. There is a mortgage on the place, and she has resolved to pay that off and maintain her children, and when her husband comes back to her they can live the remainder of their lives in happiness. Of course this is out of the ordinary, but it shows what a woman can and will do when the opportunity affords.

She can raise all kinds of poultry. Although early chickens require more care than later ones, yet there is always more of a demand for early chickens and a much better price. Do not forget to save plenty of hens for winter layers. Eggs are always a good price in winter, especially in the months of November and December. It is a good plan to pack eggs when the price is low, then, when the demand for them comes, you can take your eggs to market and secure a good price. Some people will not raise ducks because they are so greedy; but they require little care and are ready for market very early. Turkeys are not so hardy as chickens or ducks, but they can be raised with a little extra care. There is always a demand for turkeys at Thanksgiving and Christmas times. You know every one likes to have a little extra money for Christmas and you do not care to ask your husband for it. How much nicer it would be to have a large drove of turkeys ready for market, and have your pocket-book filled to do just as you please with. And there is always a demand for good butter. Not everyone makes good butter, but it is just as easy to make it good as bad. The most important part of good butter-making is to always keep your milk pans clean and well aired, and do not let your milk stand too long before skimming it. Be sure to keep your churn clean and not allow any of the old buttermilk to remain in it, for if you do your butter will be sure to taste next time. In the summer, if you do not care to make butter, it is a very easy matter to sell your milk and cream. A great many women do not do the milking, but after the husband has been out in the field, working hard all day, he has to come in and milk. Now, wouldn't it be much better for the woman to be able to tell her husband that the milking was all done and the calves fed? There are many and many such small tasks that the woman can do to help her husband. Perhaps most people will say, the woman has all she can do to attend to her household duties. Well, 'tis true with some, for they will make themselves three times as much work as is necessary. But if they would have a place for every thing and put everything in its place, or as near as it is possible to do so, they would soon find how much easier it is to get along, and would find time for many a small task that they would do if they could "only find time."

About the time for garden making the men are always busy. And who is there to make the garden? Why, there is no one left but the woman. Of course she is supposed to have some help, but the greater

portion of it will fall on the woman. Think how much can be saved by raising your own vegetables. By saving your wood ashes and making your own soap a great many dimes and even quarters may be saved. Be economical in all things, but not stingy. There is a vast difference in the meaning of these two words. You can practice economy and yet be comfortable, but if you are stingy you will be likely to be very uncomfortable in more ways than one.

Some people think that farm life is nothing but drudgery. But how very much mistaken they are. It can be made a drudgery if you choose to make it such, but if you manage as you should there is seldom a day passes but you can find some thing for a little recreation. A lady of my acquaintance says she makes it a point to read the papers each day, and I'm sure her household duties are not neglected and she has a large family too.

Then, let us each and every one look over the past and see if we can not manage differently and if we can not do something more to help along. Be industrious and not always complaining because you have to work so hard, for your husband has to work equally as hard. Help him to bear his misfortunes and hardships, and share with him his joys and prosperity. Let him know you are not afraid to soil your hands to help him when he asks you. He will ask you to do nothing that is too hard for you to do. This, my friends, is the kind of a wife a farmer needs.

FARM ACCOUNTS.

F. J. HEACOCK.

[Read before the Washington County Farmers' Institute.]

In any line of business the best system of bookkeeping is that which presents all the desired information in the simplest possible form; hence the average farmer needs no elaborate set of books, but a simple method of accounts that will show briefly and plainly his standing with individuals, the cost and proceeds of each particular crop and kind of stock, and his various expenses.

Perhaps the use of a single entry ledger as a book of original entry, as shown in the following illustrations, will require the least skill and labor and, if it is properly kept, the results will be quite satisfactory. A personal account should be a complete witness to every transaction with an individual. It should be debited when he receives value from us and does not give full value in return. It should be credited when we receive value from him and do not give full value in return.

By reference to the following illustration it will be noticed that the record of each transaction contains three points of information—the date, an explanation and the amount. The position of the amount also indicates whether the individual is debited or credited. The explanation may be brief, but it must be complete, not to assist the memory, but to take the place of the memory, for upon the completeness of our record depends its value as evidence, and the memory is not a safe witness when opposed to the figures in an account book.

PERSONAL ACCOUNT.

1899.	JAMES BRUNER.	<i>He receives. Dr.</i>	<i>We receive. Cr.</i>
Jan. 8.	To butter, \$1.75; eggs, 90c	\$2 65	. . .
Jan. 8.	By groceries		\$1 50
May 15.	By clothing, \$10.75; groceries, \$1.25		12 00
Sept. 20.	To cash on account	5 50	. . .

Our accounts with crops, stock, etc., are known as speculative accounts, for upon them we expect to gain or lose. A speculative account should be debited for all that it costs, whether in labor, material or money, and it should be credited for all that it produces whether the product is sold or consumed on the farm. These transactions should be entered each day as they occur, but in the illustration given below all the items of a particular kind are entered in one amount to save space. The figures used in this illustration represent the cost and proceeds of one acre and are based on the average of two actual accounts with wheat crops.

SPECULATIVE ACCOUNT.

1898.	WHEAT CROP, 1899.	<i>Costs. Dr.</i>	<i>Produces. Cr.</i>
Sept. 1.	To preparing ground	\$3 20	. . .
Sept. 20.	To fertilizer	2 21	. . .
Oct. 5.	To seed	98	. . .
Oct. 5.	To planting	89	. . .
1899.			
June 25.	To harvesting	1 23	. . .
Aug. 15.	To threshing	1 05	. . .
Sept. 1.	To marketing	40	. . .
Sept. 1.	To rent or interest	2 50	. . .
Sept. 1.	By 21 bushels, at 65c		\$18 65
Sept. 1.	To net gain	1 74	. . .
		<hr/>	<hr/>
		\$13 65	\$18 65

The amount of rent or interest charged depends upon the value of the land and the income that could be derived from it if otherwise used.

The cost and proceeds of any speculative account will vary with

individuals and that which produces a gain for one may be unprofitable for another, hence it is not safe to depend upon the account of some one else, but each farmer should solve these problems for himself, as much depends upon the fertility of soil, location and other conditions.

With an account of this kind before us at the close of the year we can quickly determine the cause if any crop or stock fails to yield a profit, and intelligently apply our energies to correct it.

I would urge the importance of this class of accounts, since most farmers, who undertake to keep books at all, are content to keep a record of personal accounts only, relying upon guesswork to determine their sources of loss or gain. We would consider him a poor manager in any other business who could not tell at the close of the year what investments had produced the largest dividends. And yet, with interests far more varied, we are satisfied to plan for our future work with no true knowledge of the past to guide us.

In addition to our personal and speculative accounts we should not forget our household and farm expenses and all those little loss and gain accounts that show us where the money goes and help to find the leaks. The household expense account should be charged with all our living expenses, such as clothing, groceries, produce, provisions, etc., either purchased or raised on the farm. The farm expense account should be charged with all incidental running expenses which do not add to the value of the farm and from which we expect no returns, such as taxes, repairs to buildings and fences, etc.

At the close of the year all the gains and losses from various sources should be brought together on one page under the heading of loss and gain, the losses being placed in the debit column and the gains in the credit column. The difference between the two columns will then show the total net gain or loss during the year, and we can tell at a glance our profit or loss from each investment.

Any farmer of ordinary intelligence can keep a simple account book like this and even if it is not kept in strict accordance with the principles of bookkeeping, it will at least place his business before him in such a shape that he can plan and work more intelligently and with greater assurance of success.

THE PURCHASE AND CARE OF FARM TOOLS.

J. M. T. WELBORN, BRIDGEPORT.

[Read before the Marion County Farmers' Institute.]

The farms of Indiana to-day are numbered by the thousands. And on each of these farms are found farm machinery; to some extent from

the very crude to the most improved and up-to-date that money can purchase.

As the march of civilization has progressed from east to west, the inventive genius has also come.

And we might ask the question, has the machinery that has been made and used on the farm been a profitable investment or no? Has the grain harvester that the farmer uses today been a profitable investment? It is within the memory of some of the older people here how grain was once harvested by the reap hook and bound by hand, when one acre a day was considered a good day's labor. Let us compare the two extremes; the reap hook of half a century ago, and the reaping machine of to-day; when a man with a self-binder and a good span of horses will cut and bind, ready to shock, twenty acres per day.

With the mowing scythe one acre per day was considered a good task for the mower of fifty years ago, when they observed the eight hour system, eight hours before noon and eight after noon.

At present a man with the six-foot machine and a pair of good steps, fifteen acres is not too much to expect.

Fifty years ago the task of preparing the land and planting the crops were very slow and laborious. Breaking land with a yoke of cattle and wooden plow is a very marked contrast to the bright, shining steel plow of to-day.

A task of three acres is no greater than one of former years. Likewise with planting and cultivating our crops. As in former years it was considered sufficient to keep the soil stirred occasionally and let the weeds grow along with the crops; with the cultivation in present use (either riding or walking) eight or ten acres may be cultivated in a day.

And the cultivation so complete that practically no weeds are permitted to grow. These are some of the arguments in favor of the improved tools, though the catalogue could be continued at great length, with the same gratifying results.

There is paid by Indiana farmers for farm machinery, annually, by a conservative estimate, \$3,000,000.00; others put this amount \$5,000,000.00, not taking into account the smaller manufacturers and country blacksmith, which would materially increase this amount.

With this annual expense to be met by the farmer, we ought to investigate thoroughly where these millions of well earned dollars can be invested to return the most profit.

I would not advise that farmers buy less tools, but that they find a reliable dealer that they can have ready access to, and buy tools that have a reputation and are guaranteed against defects on account of poor workmanship and poor material.

Your dealer can buy better and cheaper than you can, then should you have a break, if it is the fault of the manufacturer, your dealer will be glad to replace the defective part; whereas, in most circumstances, if

the manufacturer and consumer are widely separated, the expense and delay of getting the defective parts and the loss adjusted is not satisfactory to either party.

And the farmer may often times be very much inconvenienced by delay in getting the repairs; often at a greater expense than if he had dealt with a permanently located dealer. It may be necessary to send a telegram to save time, and then pay express; after all this expense and delay, the parts ordered or the ones sent, through neglect of some one, they will not work, then new parts must be ordered and these returned or paid for, and several days of valuable time gone.

Your dealer is better acquainted with handling goods than the farmer; if the goods purchased are not as represented, we have quick access to our dealer and the trouble quickly and almost invariably satisfactorily adjusted.

I would not recommend sending your good dollars to Chicago for goods advertised in these elaborate catalogues the country is flooded with; if you do your account will be something like this: Sent \$10.00 to—omit the name. When goods arrived was not as expected; after considerable correspondence and paying freight or expressage and patience well nigh gone, the purchaser footed his accounts and found he had paid more for the same goods than to have bought of his home dealer; besides, the home dealer lost that much trade; consequently could not give him as good a price on his next purchase.

Men have their likes and dislikes; some will champion one particular make of machinery and some another. But the farmer of this age can not afford to use an inferior farm tool.

The care of farm tools is of very great importance to both the manufacturer and the farmer alike. With an annual outlay of \$5,000,000 or more, the accumulation of farm tools is very large.

Dealers tell me that the average life of our grain binders are seven or eight years. A buys a binder, cuts his grain, unhitches when done in some convenient corner of the field, and there the binder is left until the next harvest, through sunshine and rain, heat and cold, winter and summer. When next harvest comes they cut the weeds and hitch to it and go through the operation of cutting their grain. These machines usually last three years. B buys a machine, cuts his grain, using good oil and plenty of it, taking his machine directly to the shed before unhitching; after cutting his grain, making a note of any needed repairs for next year, and getting them at the first opportunity, putting them on ready for next year's use, saving himself and dealer the annoyance of having to order them the day before he wanted to begin cutting wheat.

This machine is good for fifteen summers.

Farmers object to paying eight or ten per cent. interest on borrowed money; some of them are paying one thousand per cent. by neglecting to care for their tools.

These dealers also tell me that there is a greater loss by neglecting to properly care for these implements than actual wear. Taking that as a fact, and I believe it to be so, farmers are losing two and one-half million dollars each year by not having a place for every thing and every thing in place, properly housed.

I remarked to those dealers that I presumed there were a thousand binders out in the fields where the farmer finished his harvest. The reply was that is not near large enough, but that the number is growing less each year.

Farmers should take interest in their tools so they would be able to know when they are working at their best, often preventing a break by tightening a bolt, and giving the machine careful attention.

We cannot all take a mechanical course at Purdue, but there is a school open to all the year round, any one can enter at any time, it is located everywhere and known by the name of the School of Experience.

Some of us do not like this school, but we ought to. I know a man on a farm that was cutting grass with his mower, there was a wooden pin about five-eighths inch in diameter and five inches in length; by neglect this pin wore out, and said farmer was not mechanic enough to make another, so he went to the city, lost one day's work and a good hay-day cash expense, one dollar, or more, to buy a piece for his mower costing five cents, whereas, any farmer ought to have made the repair in thirty minutes.

The tons and tons of old iron that we see being hauled from the farm back to the city, tell the story too well how the farmers have been caring for their tools, oftentimes selling tools that should be used another year. The farmer ought to be a good thinker; able to decide for himself when he needs a new machine; not allowing an agent to decide this very important question for him.

If I would I could not tell you what these agents say to our farmer friends. And if I could I would not want to repeat it in this institute.

What applies to one tool will practically apply to all. We call your attention to the care of the plow; it should be properly cleaned and put in the tool house immediately when done plowing; avoiding the experience of former years when beginning the spring plowing with the rusty plow that refused to shed the mellow soil, causing work and worry on the farm, costing by far too much to get the plow in good working order. It would have been a good investment to pay five dollars to have this farm tool properly cared for.

There is another implement that is splendid to use on the farm, and if you have not one you ought to purchase one before leaving town. It is cheap and of inestimable value; they can be bought the world over for five cents. The name is lead pencil.

With good farm tools well cared for, and a farm well tilled, a wife well willed, we ought to be a happy and prosperous people.

THE FARMER'S WORKSHOP.

OTTO KAMP, CYPRESS.

[Read before the Vanderburgh County Farmers' Institute.]

I have visited many farms, and it is my observation that comparatively few farmers have any convenient or comfortable place in which any kind of odd jobs may be done in bad or stormy weather. I think there is no better investment upon a farm than a workshop of some description. Its outfit should depend upon the mechanical skill of the farmer. It is not necessary to be a jack-of-all trades; but there should be a good room for indoor work, even if one has but little mechanical ability. The room should be long, even if somewhat narrow. Along one side there should be a solid work bench made of three-inch oak, about two feet wide, and at least twelve feet long, to give ample room for all kinds of work. Attached to this bench there should be a strong vise, such as may be seen in any good blacksmith shop. The cost of such a vise is six or seven dollars, but the investment pays well; it can hold anything in its iron jaws from a heavy oak scantling to a small carriage bolt, and comes into use almost every time that any sort of repairs is needed. The bench and vise are essentials in the equipment of a farm workshop.

The number and kind of carpenter and harness maker's tools depends upon the skill of the farmer, but the tools that are bought should be first-class in every respect and should be kept in good order as it is a waste of time and money to have poor and dull tools.

Besides these tools there should be many supplies such as rivets, buckles, snaps, screws, bolts, nails, etc. These are most conveniently kept in pigeon holes above the bench and should be labeled according to the various kinds, sizes, etc.

A proper assortment of tools for a farm shop cost a few dollars in the beginning, but it saves time and labor and often makes it possible to check a serious breakage of some costly implement. Some farmers try to repair everything, from a strawberry box to a barn frame, with an eight-penny nail, spreading devastation when they undertake to make repairs.

Then they get the idea they can not make repairs, and little breakages go until they cause serious ones, when quite often it is only a matter of having nails, screws or bolts of the proper size.

A complete assortment of these things in connection with a small forge and anvil will save the farmer many dollars where otherwise hundreds are thrown away.

WHAT THE FARMER SHOULD KNOW AND DO IN ORDER TO SUCCEED.

W. F. EDMONDSON, MOROCCO.

[Read before the Newton County Farmers' Institute.]

When the wonderful importance of agricultural pursuits is taken into consideration, and when we remember how much on them depends, we readily see that the humble farmer of all men should possess especial knowledge and training in his vocation. So much should be said as to this especial knowledge that one scarcely knows where to begin or how far into details one would be expected to go in making a short talk on this subject. However, be that as it may, we will begin at once by laying down the broad proposition that no one will long succeed as a farmer without a correct appreciation of the dignity of his calling.

The sentiment (shall we say growing sentiment?) that divides people into castes, that hampers growth and development of character, that stamps with disrespect any of the honorable callings of men, is to be dreaded. Will you pardon us if we say we see in this misconception of truth, this distorted idea of life, this bane of society, elements dangerous to the welfare of our commonwealth?

The greatest contentment, the greatest happiness can come to any people only in proportion to the respect accorded those engaged in what is usually termed the humbler avocations of life. But we are glad to know that however lightly esteemed by some the farmer's life may be, it really takes rank with any of the leading business pursuits. This is true, first, from its great importance. No class of people holds in its grasp results so far reaching in effect as the farming class. Should the farmers go out of business, or go off on a strike—well, the earth might continue its revolution, the rivers still flow on to the sea and perhaps the laws of gravitation might not be materially altered, but there would come about conditions such as wars and trusts and labor organizations have never yet been able to effect. Farmers as a class should know that they may be more self dependent than any other; that while attorneys wait for clients, merchants for customers, politicians for places, physicians for patients, the intelligent farmer, full of resources for his own preservation, with generous hand, stands ready to minister to the needs of others.

Again, farm life offers opportunity for the broad, liberal culture of mind and heart, so necessary to good citizenship. A glance back over the history of the past century reveals the fact that corn and fat pigs are not the only products of the farm. For from the homes of farmers have come men and women who have shaped the destinies of nations and sur-

prised the world with noble achievement and profound thought. We wish to repeat and emphasize once more the statement that farmers as a class will not long succeed without a correct appreciation of their calling.

But there are other phases of this topic to be discussed. We are truly glad for the common school system of our country and feel that an era of enlightenment is being ushered in such as has not been known before. We note with interest the absence of heated discussions over such subjects as the proper time of the moon to shingle the barn, to plant the potatoes or to fill the family pork barrel. We notice, too, that the supply and demand as well for those who believe in ghosts and goblins, is happily decreasing and that the primeval methods of agriculture, as if by magic, are being transformed. Who among the farmers will be found in the front ranks of this onward move? Without question there can be but one answer, namely, that one who uses his opportunity for the acquirement of knowledge in his calling. Unhesitatingly we say that farmers ought to be educated—not the kind of education, however, that educates the common sense out of a man, but that which strengthens his judgment and quickens his perception. This leads me to say that too many of us have never cultivated the habit of studying our resources and scarcely recognize an opportunity unless it comes up and shakes hands with us, so to speak. In a word, we are rich but don't know it—rich in opportunity, rich in the provisions of nature for our good, rich in ways and means. Let us not forget the fact that the greater wisdom is displayed in making wise use of means at hand than in wasting energy in grasping after the unattainable.

Farmers ought to have an agricultural college education. But all will never have. It is within the range of possibilities, however, that the many experiment stations with their work will help in scores of ways the many who will never see the inside of college halls. Farmers should more fully appreciate, if possible, the work done by these stations. In our own investigations we are apt to struggle and blunder in search of truth and if, happily, after years of earnest toil and anxious waiting, we find it, we are surprised beyond measure to learn that through all these years it has stood as a monument towering. It goes without being questioned that the many experiments requiring years to complete can be better conducted at the stations than by private work.

In conclusion let me say that the farmer who keeps abreast of the times in the acquirement of knowledge pertaining to his business and faithfully applies that knowledge, is the only happy and successful farmer of to-day.

THE EDUCATED FARMER.

MISS LAURA NEWLIN, BLOOMINGDALE.

[Read before the Parke County Farmers' Institute.]

One of the first principles of success is to regulate our career to the best advantage as to disposition, physical constitution, and natural inclination. It seems that in the world's estimate certain professions and trades are held in higher esteem than others, considered more respectable, so the great mass of people rush after the respectable and lucrative ones. The truth is that every one grows in power symmetrically only when he is in his place. When he feels he has found that place, he should bring to bear his intelligence, education, and moral powers in order to fill it well.

To-day we are interested particularly in those who have chosen agricultural pursuits. It is a prevalent belief that there are more and better chances for advancement in other lines than in this line. Farming has been made repulsive because there has been so little sociability. The home of the farmer has been uninviting because he has been wasteful and careless. His crops have failed. His fences are tumbled down. His gates are off their hinges. His barnyard is full of rubbish. His machinery is left out to rust. His fields are full of weeds and everything has an air of general disorder and confusion. Not because he has been idle. Farmers do not need to spend more time at work, for too many are already working beyond their strength. The thing they need is to think more and there will be less need for hard toil. When men think, instead of working blindly on without calculating what they may expect as a result of their labors, we will have more contented and thrifty farmers. Scarcely any other occupation opens so wide a field for the profitable and agreeable combination of labor with cultivated thought. The mind already trained to think can not fail to find in the field of agriculture an exhaustless source of enjoyment.

Every grass blade is a study, and to be able to produce two where there was but one is not only pleasurable but profitable. Education can be and must be used to advantage on the farm. We must get rid of the notion that learning unfits one for work. Some men seem willing to do anything that is not regarded as work; anything that can be done in town in an office, but they regard work on the farm as drudgery.

Such an education should be called ignorance. Cities are places for work, strife, and unrest. Hard as the farmer's work may be, it is at no time more laborious than that of many a mechanic nor is it ever so

monotonous. Seldom does it require that mental application which is required of the business man. Each changing season on the farm brings its own work to give that rest, which comes to mind and muscle alike from change of occupation. The young man who leaves the farm for the merchant's desk, thinking to ennoble his toil, makes a mistake. Would that we might judge the dignity of labor by its usefulness and manliness, rather than by the gloss it wears. The need of a better knowledge of the underlying principles of agriculture in general and a more thorough and practical application of these principles by farmers should be conceded without discussion.

Not only will the farmer be benefited by this knowledge, but the general public as well. All things which surround us are our education, but our advancement depends largely upon our ability to appreciate and appropriate the helpful elements of these surroundings. An education can not be completed in the high school or the university, but must continue through all the years of one's life.

Every profession has its library of theory and this is contained in books from many different authors. Farmers should be acquainted with works of leading agricultural authors. The need of every age calls for literature suited to its wants. The agricultural books of today by practical authors are more exhaustive on any one subject than a paper or magazine can be, but since the farmer must have machinery and too often neglects his library, which he might have if he really saw how much he were missing without it. Since he does not, as a rule, provide himself with an extensive library, he can at least supplement it with leading agricultural periodicals, which will come to him laden with fresh and helpful suggestions given as the experiences of energetic and successful farmers, which are an education within themselves.

While we would not have the farmer confine all his reading or all his thought to his particular line of work, we would have him give it preference. This is a day of specializing, and if he believes he should be a "tiller of the soil" he should make it a profession and study it as does the doctor or lawyer. A farmer can no more succeed without it than can those in other vocations. Owing to the constant changing of climate and soil, farming can not be carried on as it once was. With changes in physical conditions must come changes in method. The time has passed when grains or fruits can be planted and "just grow." We have but to look at failures in crops to see that all farmers have not been working along professional lines as they should have been.

We should not allow those to whom we look as leaders to do all the thinking and experimenting. Each farmer should know the condition of his own soil. The study of soils, seeds, fences, flowers, fruits, machinery, plowing, reaping, drainage, sanitation, rotation of crops, diseases of crops, and live stock each is an extensive study within itself. In all this an education is not only valuable but really necessary. It takes knowledge

and that well applied to be a successful farmer to-day, as example of our knowledge may be directly applied. Science is highly valuable. Botany assists in dealing with all growing crops, chemistry in the analysis of soils and the selection of fertilizers. Natural philosophy is helpful in almost everything. The mechanical branches, especially in the manipulation of machinery. The educated farmer knows that plant life is sustained by what is digested for it from solids, the moisture and the air. That the lives of animals are sustained by what they eat, drink and breathe, and until all farmers understand the philosophy of feeding animals, soil and plant life, they are working backwards.

They must know how the elements that first enter into plants, through them into animals and through animals and vegetable growth perform the service of changing the waste into plant food and complete the cycle.

Humus is a sort of storage battery of the soil. A soil deficient of this property is often called a dead soil and is not capable of producing the better types of vegetation. When the farmer sees his ground covered with wire grass, sour sorrell and knot grass, instead of nutritious grasses and grains, he should know that the thing to do is to feed that soil. To know how animals and plants live by food, drink, and air, and change them into animal forms or plants, is worth thousands to those who feed animals and cultivate crops. If it be suggested that this is mere theory we have but to note facts to see that we have passed the age when we can not find abundant evidence that it is practical.

American farmers, with their broad fields, improved machinery, and mixed agriculture, are in the best condition of any in the world. What is now needed is a study of neatness, thoroughness in cultivation, and a better management of farm work in order to make it less burdensome. Every farm should be so arranged that employment may be given as much as may be to every month of the year. Too often we see spring work piled up to be done in the summer months. All this makes farming harder. Even in February or in blustering, disagreeable March, between squalls, the clover seed may be sown, next winter's wood cut, fences repaired, orchards cleared up, and all the farming implements, which we will suppose have been carefully housed promptly after using, to be reviewed and put in good order if necessary, so that when the busy seasons come no time need be lost in repairing machinery. If there are any colts to break, this should be done early that they may be ready for heavier work when it comes. Farmers should have a real pride in their business. They must make it more profitable so the boys will not be so eager to get away from the farm. They should be made to feel that cultivating the soil is a privilege rather than almost a disgrace. They should not suppose that college education is thrown away upon them unless they leave the farm to enter some other profession. The cultivating of the soil was the earliest occupation of man and is the best business for the average person, although, by mismanagement, not always the most profitable; but

study to be a better farmer and make the calling more attractive. The farm dwelling need not be ambitious or palatial in order to be a home of convenience, comfort and beauty. There should be grass, trees and flowers. Everything kept in order about it, inside and out, and there should be an air of thrift. The comforts of the city should be combined with the beauty of the fields. Farm life is relieved of the slavish conventionalities of fashionable society, which nobody really enjoys. There is a freedom, beauty, and simplicity of manner in cultured farm life which is rarely found in city homes. The farmer has a great deal of leisure during the winter months which he may spend in intellectual improvement

Constantly surrounded by the varying beauties of nature and the harmonious operations of her laws, he is led to reverence the wisdom of the Great Mind and to consider the philosophy of the universe. He has been called nature's nobleman who has heaven for a canopy and the earth for a throne.

Philosophers, statesmen and orators of all ages have laid their good will offering on the altars of agriculture. There is nothing in the plowing of fields to make one ill-tempered. To look upon the sunny slopes of grain does not make one unjust. For the farmer to succeed, it is not necessary for anyone to fail. His harvest benefits all and injures none. Farmers must be more zealous for their rights—must give more time and money, if need be, in asserting their rights. It is a mistake for farmers to conclude they are too busy to be interested in politics. It is their duty to study the social and political condition of the country.

Dr. Strong says there is a rapid and disproportionate growth of our cities and a very strong probability that this condition is to increase rather than diminish in the years to come. Already the cities in some states have the controlling power in electing law-makers and rulers. It seems evident that our cities are, or soon will be, able to control legislation in their own interests. While the interest of city and country are interdependent, there is, at the same time, a disposition for those who live in towns and cities to legislate adverse to those interested in agriculture. Farmers can not afford to be ignorant of the political conditions. Whatever militates against the interest of the farmer tends to undermine the material interests of the whole country. Not only should the farmer be intelligent along his particular line and understand the political and commercial conditions which so greatly affect him, but, for his own pleasure and profit, he should cultivate a general intelligence and thereby become a more useful citizen. Agriculture, in its highly improved state, contributes largely to the enduring prosperity of a nation. All trades and commerce depend upon it as their foundation.

If education has for its results the erection of telephone lines, improvement of roads, the organization of mutual improvement societies, well-filled corncribs and cellars, better shelter for stock, the adaptability

of food to the needs of animal and plant life, it can not fail to be of vast benefit. An education in its broadest sense in any line is not confined to the bare knowledge within the lids of particular texts. An educated farmer is one who lives in the spirit of the times, who keeps abreast with the best methods, who does not allow his work to be drudgery. He must understand what relation agriculture bears to other pursuits—how his failure or success may affect another. This alone involves an understanding of the condition of the commercial world. An uneducated farmer earns from \$10 to \$20 per month while the educated one earns from \$50 to \$100 because he understands how to get the maximum of results at a minimum of expense.

Some one has likened the farmer's education to an edifice in which if the foundation is common sense, the siding and shingles those branches especially adapted to the necessities of the farmer, he will then desire to put on a cornice of poetry with musical medallions, an astronomical cupola, with philosophical minarets and fanciful arcades.

If the farmers will cultivate well without waste, if they will so build that their homes will be convenient and comfortable, if they will occupy leisure time in reading, thinking, in improving their minds in order to keep in line with the thinking world, if they will spend time in devising ways to make their business profitable and pleasant, if they will cultivate sociability, then there will be real enjoyment in life. Life on the farm can be made so the boys and girls will grow up in love with the meadows, the woods and the old home.

Around the farm may cluster the happy memories of delightful years.

WHAT IS WINNING TRUE SUCCESS ON THE FARM?

L. E. GLAZEBROOK, RENSSELAER.

[Read before the Jasper County Farmers' Institute.]

"What is winning true success on the farm?"

What is success? What is the standard by which it is measured, and where lies the line that marks the division between it and failure?

Look around our different neighborhoods; compare the life, labor and achievements of our different acquaintances, and who do we count successful, truly successful?

With the majority, success is measured by dollars and cents, by land and by live stock. The man who, by whatever means, has gathered unto himself broad acres and many cattle is, by the most of us, considered successful.

Money is no more the measure of true success on the farm than it is the measure of true success in any other calling of life. Men whose lives have blessed the earth, whose names we hold in sacred remembrance, were not men of money; had their success been measured by dollars and cents the world would never have known them.

Again, when we are examining our brother's life work, when we are looking to see upon what side of the line we are to place him, we must consider his mental and physical abilities, his environments and opportunities. Count not that man a failure who uses, as best he knows and can, his feeble powers, who battles against environments and diligently seeks opportunities; count him not a failure even though in the end he die a poor man just outside the country house, for, considering the weapons he has had to use, and the foes he has had to meet, he may have fought a good fight, and justly deserves to have his name placed on the honored roll of the truly successful.

There are not so many failures on the farm as some would have us believe, or else there would not be this grand accumulation of agricultural products that we see on every hand; these products are but the fruits of industry and thrift, the very keystones in the arch of success in each and every calling.

Once in our hearing, in a different part of the State, an old farmer, complainingly, remarked to a neighbor that his life had been most a failure; he said that others had far outstripped him in the race, that while he had only sixty acres of land, others had been able to get one hundred and sixty, some two hundred, and one near by, seemingly no wiser, stronger or better than himself, had five hundred and over.

His friend replied: "You are a man sixty-six years old, well preserved; you have gained for yourself a comfortable home, your farm is well tilled, every acre is productive, everything about your little place is convenient and handy; you, perhaps, owe not a dollar in the world; you have never been really needy in all your life, always plenty and to spare, and much I know you have spared without money and without price, you have enjoyed the fruits of your labor, raised a good-sized family that is now both a credit and a pleasure to you; you have not been an idle man by any means these forty odd years, nor have you been one that worked unreasonably hard; in a word, you have taken life as easily as circumstances would allow, and to-day, considering your age, you are a stout, hearty, healthy man.

"Do you call such a life as this a failure? By the work of your own hands you have supplied yourself with plenty, led a life of contentment and usefulness. What greater success could a common man ask?

"You say others have more land. Yes, but do they have more comfort and happiness? Compare yourself with the man whom you said had the five hundred acres, not so old as you by four years, but in appearance twenty years your senior; he has worked like a horse, denied himself the

commonest comforts of life, and today you know he can not lift both hands to the top of his head. There was never any pleasure in his home; work, work all the time, nothing but work. He never had any money or time to spend on anything that did not promise him immediate return in cold cash; no tree did he ever plant unless sure he would get the fruit, not a real friend, perhaps, has he in all the world, for never one penny or one minute did he spend in the friend-making business; we need not go further with his case, we both know it well enough.

"Your little farm, your life-work, your honored and respected sons and daughter are of far more worth to you this day than could possibly be all the land you ever saw.

"You and your likes are the only successful farmers I know."

Such is the substance of the conversation heard between the complaining old farmer and his comforter, and we think it pretty well answers the question, "What is winning true success on the farm?"

To be truly successful on the farm, a man must, by his own honest endeavors, make and enjoy a good living. And a good living is plenty to eat and plenty to wear, reasonable work, seasons of leisure and recreation, time to read, to be neighborly, to visit and to be visited, time to talk and to think about something besides hogs and cattle—a good living is the honestly getting and using, for our own and our family's comforts, all the good things nature has to give in exchange for reasonable physical and mental toil. There must be something besides the accumulation of property to win true success; the accumulations must be used and enjoyed to make success complete.

There are two classes of farmers—one makes, lives and uses a living; the other makes, dies and leaves a living for somebody else to use.

There is no harm in farmers accumulating property, no harm in farmers getting rich, but riches gained by excessive and unreasonable toil, by pinching and painful self-denial, close, stingy dealing, makes a man lead the life of a slave, a miser and a pauper.

Then, "winning true success on the farm," we think, is living to farm, farming to live, and living while you do farm.

WHY SHOULD NOT FARMERS HAVE SEATS AT THE FIRST TABLE?

ERNEST HIXON.

[Read before the Lake County Farmers' Institute.]

I have been asked by our chairman to discuss this subject of "why should not farmers have seats at the first table?"

Farmers are producers, and, as a rule, undoubtedly live on the best

the land affords, and in that sense do have seats at the first table; but the interpretation I wish to give this subject is "why should not the farmer be treated as an equal, both socially and politically," and in this sense I claim they do not receive their just deserts.

I feel that I am incompetent to do justice to this subject in this sense, but knowing that it is receiving all too little attention by the people who are interested, I shall do my best.

I feel that this matter should be brought up and discussed at every farmers' institute in this country, because I am satisfied that it is coming to be a subject of vital importance, not only to the farmers themselves but also the working classes in general, and finally will in a measure decide the welfare of this country.

In presenting this article I have no desire to belittle anyone else or their occupation, but am actuated only by a desire to lift up and set to thinking my fellow farmers who have too long submitted to be turned down as regularly as they aspire to an office or a position of trust which any of their so-called superiors wanted. Is it possible that clothes make the man? It seems so sometimes, but it should be remembered that everyone must wear clothes suitable to his business. The farmer can not afford to wear broadcloth and fine linen at his every day work. Is he, therefore, to be snubbed and looked down upon by every jay that comes along?

The great stumbling block among our farmers is their lack of ability to express themselves in public. They do not come before public gatherings often enough to give them confidence, and they consequently do not acquire the habit of thinking rapidly in order to express themselves clearly. Now, in this connection, I wish to say that we have a subordinate grange in town which meets once a month, our chairman here Worthy Master. This grange is an excellent school for any who have not good use of language or who lack courage to express themselves. Now, I should like to see a great many farmers join this grange, and take an active part in the discussions and debates at their meetings, as I am quite sure most of us can receive great benefit.

It is often the case that the farmer has in him the latent ability to succeed had he only the courage to express himself in public, but lacking that he is pushed aside by others who are advancing all around him, and if he doesn't get the spirit of progress and strive to push ahead as they do the chances are that he will be left behind and numbered with the fogies.

You see it is generally conceded that the farmer is the foundation of the nation's wealth, and yet, when it comes to a recognition of his services or a division of the honors, he is completely overlooked.

Why is this so? Have we not men of as great ability among the farmers as any other class? If Abraham Lincoln and James A. Garfield,

both farmer boys, could come to the presidency then there is chance for other farmers.

Farmers as a rule put in too much time at their work and let the lawyers do all the planning and talking. How can we expect any favorable legislation when we elect our lawmakers from a class who have no sympathy with the farmers or working class of people?

I should like to see this subject added to discussions at our farmers' institutes: "The preservation of the political independence of the farmers of the United States."

The social feature of our institute is good, bringing together as it does the people from the town and those from the country. So, also, are the discussions of farm subjects good, but I also think a little farm politics will not hurt, but do a great deal of good.

The Farmers' Institute is the place for farmers to be both seen and heard, and this is one of the subjects on which we farmers can stand considerable educating. The desires of the farming class is no longer catered to or regarded by the political boss with the awe which used to exist. This is largely due the substitution of mere party for patriotic standards of judgment and a decline among farmers of independence of political thought and action. Are we to become little better than serfs, as they have become in England, France and Germany, whose type is so admirably depicted in Edwin Markham's poem, "The Man With the Hoe," where he describes him as "stolid and stunned, a brother to the ox," or shall we strive to sharpen up our wits and discuss these subjects at our farmers' meetings, and when the time comes be ready to act with intelligence and decision. This will soon cease to be a government of the people, for the people, and by the people, if the crop of rotten politicians is allowed to multiply as rapidly as it has in the past few years.

There is greater need than ever before for the resolute independence of character and political judgment which once characterized the American farmer. We should be equally alive and active in this direction for our own sake as farmers, and for the sake of our country. The present corrupt party leaders with their assessments on corporations and control of legislation would not have stood before the courageous judgment of the farmers of the country twenty-five or thirty years ago.

This political hyena, who today thrives on the political and material fortunes of his fellows, has fastened like an octopus on the nation, and holds a dangerous power in our legislatures.

Ex-Governor Hoard, of Wisconsin, in an address before the Farmers' National Congress, recently held in Faneuil Hall, Boston, Massachusetts, had this to say touching this subject: "It is largely through this submergence of the political influence of the farming classes that the present unfair and offensive systems of taxation exist. Property is property, taxation should be based on the dollar's worth of property, no matter how

it is invested. That which the law recognizes as property and defends as property should be taxed as property according to its value."

A general violation of this principle is producing widespread demoralization and discontent in society, men who pretend to be men in everything else calmly become perjurers in order to save a few dollars in taxes. The final effect may be comprehended in this question: If a man will swear falsely to cheat the public, how long will it be before he will perjure himself to rob his neighbor? For this condition Governor Hoard suggests the following remedy: "After the assessor has completed his work, and a month before the final review, let it be required by law that the personal property list shall be published and placed before the public eye. There is great moral force in publicity. As farmers especially we should create public sentiment in favor of some such law as this, for a very large proportion of the property of the country escapes taxation."

You remember in the history of France that when the laws made by the directory became obnoxious to the people. Bonaparte deposed the whole body of law-makers, and dispersed them at the point of the bayonet. He then filled their places by men from the lowest walks of life, rightly arguing that they already had law enough, and that this body of ignorant men would be apt to enact but few laws, and such as they did make would be of the common sense order. Gentlemen, that is nearly our own situation. We have multitudes of complex laws, many of which are obsolete and not enforced, yet every year we pay a set of men big wages to go to our State capital and pass a lot more foolish and complex laws, most of which, sooner or later, are taken to the supreme court only to be declared unconstitutional. What we need is less law and more common sense.

If our present law-makers, when in session at the capital, had wanted to do their whole duty as men, they would not have been preaching reform with their mouths while they practice extravagance with the people's money. They should stand up for what they believe to be right and just between man and man, and enact as few laws as possible; then, if they had made the various appropriations required of them and wiped out several hundred of the senseless and vicious laws now on the statute books and adjourned in the shortest possible time, they would have earned their salaries and the applause of their constituents. A very little government is much to be preferred to an almost endless variety of indifferent or pernicious legislation. The people are governed too much already, we do not wish to be governed to death.

The farmer pays a larger per cent. of taxes (as compared with his holdings) toward supporting our public institutions, government, laws, etc., than any other class, but though he seemingly has a voice in the election of our law-makers, and thus in the making of the laws and the managing of the government, the whole situation is so thoroughly handled and controlled by a few smart wire pullers (not farmers, you may be

sure), that the best he can do is to choose the lesser of two evils. Is this equity? Is it justice? No. Let us go to our primaries and put forward the best men we have, and then support them regardless of partisan politics. In this manner only can we ever hope to be heard or expect to secure a portion of our just deserts. I quote Governor Hoard again; he says: "I would not advocate the formation of an agricultural party to correct this evil, for I do not believe that any man should administer his political duty according to the trade he follows, the race he belongs to, or the religion he professes. But I do hope to see the farmers stand forth as strongly as they did of yore, the terror of corrupt politicians and the hope of honest government everywhere."

This can only be brought about by a steady refusal to follow the lead of corrupt party leaders in all parties. Our first and most important interest should be to arouse the minds of the farmers to a broader understanding of this question.

WHAT IS THE BASIS OF AN EQUITABLE LAND RENT?

J. C. GOODWINE, WEST LEBANON.

[Read before the Warren County Farmers' Institute.]

In all countries, from the olden time since man has followed the edict of the Master; when He turned Adam out of the garden to go forth to eat bread by the sweat of his brow, there has been an unceasing contest.

At our distance from the transaction, it seems to me there should have been no question of equity of rent for the garden on the part of the tenant.

Farming or agriculture is the basic foundation of a living; or the profession that provides the means from which human food supplies are drawn.

The diamond fields, the gold and silver mines, king cotton with its millions of spindles, the silk looms of the east, the merchant ships, the railroads with their many trains would all stand still and be as naught to support human life in the absence of garden and farm products.

If it had not been that some of Noah's sons and their wives had been looking after the flocks and herds and planting beans and potatoes in the garden and a few nubbins and pumpkins in the field the old man would not have had time to plant those vines the product of which made such a fool of him later on.

An equitable land rent from a standpoint of interest on investment

to the owner should be estimated on a basis of what it can be made to maintain as long as it is taxed, the standard of yield.

In the case of a much regulated human effort on the part of tenants in this country it often appears to be their purpose to get all they possibly can out of a year's crop or a certain field for a certain period of lease, get it as soon as possible and change farms. The cash system, accepted too often by non-practical farmers, encourages and often brings about such changes. The early ways of farming in this country, if the field, the season or the land did not suit the American tenant, he moved over on Uncle Sam's cheaper land at a lower rent.

This is practiced yet to some extent where lands are cheap down South. When a field becomes worn—turn it out to rest and take any new field.

In England and eastern countries change is less frequent than in America. There it is very common to find three generations of tenants on the same premises. We have heard of what is called an equitable land rent in Ireland, but I better not discuss rents in that country—some Irishman will be sure to get furninst.

Whoever rents land for grain or cash should consider well what will be its condition at the end of the lease. All who have lands to rent are not practical farmers and as land, being considered a safe investment, a nominal rent may bring the owner a good per cent. on its value. It should be the owner's constant effort to bring the land up to a higher state of production. This can not be done under a cash system as many landlords well know to their sorrow.

An equitable land rent, from the standpoint of landlord and tenant, is now under consideration. Rents do not appear to be uniform owing to various conditions. The man who has a farm to rent should not take all he can get. Too often the man who wants to rent lands has to compete against some one more hopeful and the cash offer of rent is advanced above what is a safe price—more than a fair interest on value of land. Then the tenant begins to rob the soil.

An equitable land rent from a standpoint of a reward for judicious and skillful farming pays the owner of the land the best interest on his investment when he gets a fair share of the crops; and for the man that holds the plow, who may be a young man with a first crop of his own, a share of the crop relieves him of much risk and worry in handling and marketing the crop to make cash payment of rent. Farming should be as systematically managed as banking or any other business; and any industrious managing man can make more than a living giving a share for rent.

In farming, as in all other business, labor and capital should go hand in hand. The landlord and the tenant should both keep correct accounts of time and material employed and when it is found that the tenant has spent five or six dollars per acre to raise a seven or eight dollar crop on

land that has cost the owner \$50 or \$60 per acre, there is plenty of room in the field for discussion of what is an equitable land rent for that particular field in that particular year.

And equity to the tenant should be on a basis that he could be able to save something over and above expenses each year and by a proper tillage and rotation of crops bring the land to a higher standard of productiveness. This is seldom done under a cash system. A conservative landlord makes his bankable rent notes come due too soon to give the tenant the best time to market the product and greedy grain dealers grow saucy in the scramble for a large crop at a low price and before the farmer knows if there will be any crop the succeeding year.

When I first became acquainted with farming and tenants, some would go two or three miles and farm ten to twenty acres, raise from twenty to thirty bushels per acre and give one-third rent, land \$1.25 to \$5 per acre and the price of corn ten to fifteen cents per bushel—a good interest on the money paid for the land. Now land at \$50 to \$75 per acre puts a new feature in the field of investment. The tenant of today can drive two teams at once, raise forty to sixty bushels of corn, the same of oats and gather from forty to sixty bushels of each to the acre and do better to give half of the crop than cash.

On a basis of shares it is better for the tenant as well as land owner.

If the farm is not kept up and will not produce anything the tenant does not give anything but his time, and the owner can let the land sell for taxes and both are even. A good farm with proper improvements is worth at present custom half the products.

On the basis of half, this year, when oats made forty bushels, and were sold at twenty cents per bushel, it would make the landlord \$4 rent, which is 8 per cent on \$50 land.

I have a small tract of ten acres in corn, planted late on what was a wheat field and clover sod. The tenant has my part cribbed—300 bushels (at twenty-six cents), \$7.80 per acre rent. Is the tenant paid for his labor? This same tenant has eighty acres more of the same farm in corn, which was planted early in May. He claims that it will yield sixty bushels per acre. Now if this corn is sold at thirty cents per bushel—sixty bushels at thirty cents, \$18.00. This land cost about \$40 per acre. The per cent. looks like usury, but there is no law against such usury. Labor is paid; capital is rewarded; equity seems to be accomplished. This may be more than an average; I think it is, but my efforts are along that line. If I fix my land to bring a crop I find good tenants; if I fix my tenants they want to stay with me; if I fix the farm and buildings I encourage comfort; if I make cribs and bins for the grain raised on the farm I encourage economy and thrift. When there is a bountiful crop, store it and take care of it; encourage the tenants to do the same, and when the famine comes you may not have to go to Egypt for corn.

FARMING BY OBSERVATION.

M. W. PERSHING, TIPTON.

[Read before the Tipton County Farmers' Institute]

Farming by observation is an easy occupation. You practical farmers who farm with your hands and heads, do not know what pleasure and leisure and solid comfort there is in farming by observation. The man who farms by observation can stand at one side and dictate and criticise and make suggestions that would make an old experienced and practical farmer feel like kicking the presumptuous observer into a cockle-bur patch or into a thicket of Spanish needles. I do not know why your program committee assigned to me this subject, unless they conceived the idea that if anybody did have a knowledge of farming, I surely had.

Perhaps, they heard that when I was a boy that I plowed corn for a couple of hours one afternoon, when my uncle came and drove me out of the field because I plowed up more corn than I did weeds. I must confess, however, that I did have a little experience in practical farming at one time. I undertook to raise some potatoes and I worked hard and long and cultivated them every morning and evening. I had a splendid crop. I was proud of my potato patch. One day I was standing on the street and I overheard Billy McBride bragging about his potatoes. I told him that I had a better crop than he had. He would not believe it and challenged me to prove it. We went to look at my potatoes and when we got there I thought that Billy would die a laughing. He ripped and he roared and he laughed and kicked up his heels. I stood there like a dummy, wondering what on earth was the matter with him. When he had recovered from his paroxysm, he showed me that I had pulled up every potato vine and had the finest crop of cow persley of any man on the street. I became disgusted with practical farming and went to farming by observation. I, for some reason over which I had no control, was born in a city, always lived in a city, and what farming I have done has been by observation. One of my earliet recollections of farm life was when I was a boy about eight years old. A few of us boys ran away from home one afternoon, and, going into the country, we came to a farm house where they were threshing wheat. It was a great curlosity to us. We had never seen nor heard of anything like it before. The horses would go round and round and a man would stand in the center with whip in hand yelling at the top of his voice, while another man would put the straw into the machine at one end and it would come out at the other. We staid rather late, and, fearing our parents would welcome us home with a hazel switch,

we hurried back to town. Upon my arrival home I ran into the house, almost breathless, and meeting my father, I said: "Oh, pa, I was out in the country and I seen them grinding straw." It is needless to say that it so tickled my pa that I escaped a whipping. In my childhood there was nothing I looked forward to with greater pleasure than the annual visit to my grandfather's farm home, thirty miles away. Grandma, that dear old German grandmother, the dearest of all mothers, was always ready for my coming. In the great bake oven she would make twisters and pies and cakes and corn pone, and on the table would be spread chicken and potatoes and corn and beans, tomatoes, fried eggs, bacon and ham; the table even loaded down with good and wholesome food such as we do not nor can not get in town. Those were happy days. A boy that never had a grandmother living in the country can comprehend what joy, what happiness, what pleasure, what indulgences and what luxury a grandmother can bestow on a boy in the country. I was too young to comprehend much about farming, except to ride the horses, drive the cows to pasture, feed the pigs and chickens and gather apples and gooseberries, but as I grew older I began to do some farming by observation. My observations may not be correct, but they are impressions that become fixed upon my mind by passing through the country and noticing how farmers farm and how some don't farm. I would drive through the country and come to a farm house, beautifully surrounded with shade trees and flowers and green, grassy yards. In the house, perhaps, I would hear sweet music and the voice of a farmer's beautiful daughter, and in the open air I would see children romping and laughing and playing, and every evidence of a happy home. Near by would be a clean and well-kept barn yard, the stock slick and fat, the chickens well housed, the hogs in dry pens and the horses and cows in well-kept stalls. The fields clear of stumps, the fences in good repair, the fence rows clean, the growing crops well advanced, and every sign of prosperity, thrift and enterprise. To live in such a home is like living in paradise.

I would go a little farther and come to another farm house. Not a shade tree, not a flower nor a spear of grass about the premises. All bare and bleak and unhomelike. The hogs sleep in under the house, the chickens roost on the fence, and the horses and cows are protected from cold and rain by a friendly straw stack. My observations are that some farmers have no concern about the beautiful, no conception of happiness, no pleasure in home life nor ideals of nature's blessed gifts. My observations are that the beautiful and well-kept home is where they have music and good literature. They read good newspapers and good farm and stock journals, and the farmer farms with his head as well as with his hands, while the other farmer farms with neither. My observations are that a lazy man can not be a good farmer. When I see a farmer in town almost every day, and all day at that, my observations are that he either has a lot of big boys to attend the farm, or else his wife takes care

of the crop, milks the cows and feeds the stock. That farmer usually has a crop failure, empty granaries and an empty pocketbook.

A few years ago my wife and I were riding out in the country, and we were passing by two fields of corn, one on either side of the road. The corn on one side was green and thrifty, while that on the other side was sickly and yellow. My wife asked me why the corn on this side of the road was so much poorer than that on the other. "Oh," I said to her, "I guess that the man that has the poor corn is a Democrat." But this didn't hold because I afterwards learned that he was a Republican. My observation was that the field of good corn was well tilled, the soil well fertilized, the planting was done in season instead of the moon, and the ground was thoroughly pulverized, while the other man either planted his corn in the moon or when it best suited his convenience. He failed to properly fertilize and pulverize the soil and depended too much on nature to perform that which was intended for him to do. There is little or no excuse for a field of poor corn in Tipton county. The soil is rich and productive. It will yield, and does yield, when hand and head perform their parts. No matter how rich the soil or how productive it may be, old mother earth will wear out, her vital forces become absorbed and her energies exhausted. It must be fed and the substance that has been drawn from her must be returned. My observations are that the farmer that neglects his lands, impoverishes the soil and hopes for rich returns, is the farmer that is disgruntled, dissatisfied, and, to him, the world is all wrong. He is jealous of his neighbor, charges his misfortunes to the administration, and blames the Lord for discriminating against him.

In passing through the country, in my observations, I sometimes notice a harvester or binder stored away in a fence corner and a plow leaning up against a stump, and farming tools of all kinds scattered here and there exposed to all kinds of weather. Now, I don't know, but I do not believe that a man can do a very good job of plowing with a rusty plow, nor do I believe that the harvester that stood out all winter will run easy and smooth and do good work. A few years ago I was talking with one of our agricultural implement dealers and he was telling me of how many harvesters he had sold that season. I was surprised at the number, for, if other dealers had sold as many machines in proportion, it would seem that every farmer would have a new machine. I asked him if the sales were unusually large, and he answered, "No, for the reason that the life of a binder is only about four or five years." I could not understand it and I asked a farmer nearby what he thought about it, and he said that he had used a binder for ten years and that it was good yet. Another man told me that his father sold an old rake binder at a public sale that had been used for twenty years and it was still doing good work. The dealer said that he had sold as many as three binders to one man in five years. My observations told me that the man that kept his binder for twenty years, took good care of it. When the harvest season was over,

he would take his binder to his machinery building, and there he would paint it and cover the iron work with tallow and beeswax, and when the next season would arrive, he had a machine that was almost as good as new, while the other farmer had to buy a new machine and give his note for it at six per cent. interest.

One day I was down at the junk shop, and I saw piles and piles, and tons and tons of old iron representing all kinds of farm machinery, more than fifty per cent. of it the result of bad care and exposure. Why, if I took no better care than that of my machinery I would have to buy a new printing press every three or four years, and at the low subscription price of one dollar a year, and twice a week at that, I would go into bankruptcy every year. Ol Campbell told me that a very large portion of the junk was as good as new. That few of the parts were worn, but the machines were cast aside because the bolts were allowed to work loose and the joints out of gear and the machine allowed to go to rack simply for the want of a little care and a few dollars expense at the proper time. I am glad to say that my observations in recent years have been that there has been a very decided improvement in the care of machinery. Most farmers store away their machinery and farm tools and protect them from rust and weather. By so doing they save hundreds of dollars, and the occupation of the junk dealer is not so profitable. My observations are that the heaviest expense to a farmer is the purchase of farm machinery and that with a little time and care and a few cents worth of paint and tallow and beeswax, will save a large sum of money.

Here my observations turn in another direction. I notice that farmers oftentimes destroy their own markets by raising poor grain and poor stock. I sometimes hear a man grumble because he did not get as good a price for his stock as his neighbor did. Perhaps some of you old experienced and practiced farmers have never found it out, but my observations are that it takes just as long and costs just as much money to raise and fatten a little runty, scrawny pig as it does a thoroughbred Chester White or Poland China. It costs just as much money and takes just as much time to raise and fatten a steer without good breeding as it does a high-blooded thoroughbred. The little dwarf half-bred calf can be made to weigh seven hundred or eight hundred pounds at two years old, while the high-blooded thoroughbred can be made to weigh ten hundred or twelve hundred pounds at the same age. We see in the market quotations prices for high grades and low grades, and the man that is satisfied to raise low grades must be satisfied with low prices. I have seen colts at two years old sell for one hundred dollars and even more, and then I have seen colts sell for fifty dollars and even less. It costs just as much money and takes as long a time to breed and raise a fifty dollar colt as it does a hundred dollar colt. It never has been explained to me why

some farmers insist on raising low-grade cattle and fifty dollar colts when the cost of raising high-grade cattle and one hundred dollar colts costs no more. Perhaps I might understand it if I was a practical farmer and not a farmer by observation.

One of the every-day observations, particularly in the winter time when the weather is cold and damp, I often see a farmer come to town, his horse covered with frost and the man chilled to the marrow. He will tie his horse to the hitch rack and run to the nearest fire, and, perhaps, go to a joint where he will take a nip of joyful oil to drive out the cold, while the poor old horse stands at the hitch rack chilling and shivering with cold, without a blanket or cover to protect him from the chilly blasts of zero weather. He can not go to the fire, nor take a nip of hot toddy, for his cruel master has tied him to a post. My observations are that some farmers will drive a horse at his topmost speed until he is heated, and then let him stand two or three hours in the cold without a blanket or cover. Sometimes you see in the newspapers an account of the sudden death of a valuable horse without any explanation of the cause. Perhaps it was lung fever or pneumonia. Perhaps this horse stood at the hitch rack for two or three hours without protection, and the exposure caused his death and a loss to his owner of a hundred dollars or more. Why a man will take such chances as this on a horse worth fifty dollars, seventy-five dollars or a hundred dollars when a blanket will only cost him a dollar or two, is one of the great mysteries to a farmer who farms by observation. If that horse, that good old faithful family horse could only talk, what stories he could tell, and what good advice he could give his master. It is cruel and wicked to allow a horse to stand and suffer when so little time and expense will protect him. All owners of horses should read the story of "Black Beauty," the best story on the treatment of the horse I ever read.

When I first came to Tipton county I thought that it was the tag end of all Christendom. It appeared that the great Creator had made a good world and then gathered up all the rubbish and dumped it into Tipton county. It was the most God forsaken, woe-begone, desolate, and the most uninviting section of country that mortal could choose to inhabit. There was the Devil's Den, Texas, Slacum, the Black Swamp, String and Round Prairie and Hell's Half Acre. Swamps and sloughs and ponds everywhere. Frogs and mosquitos in countless numbers. In some places Cicero creek was a mile wide, and Mud creek spread out all over Liberty township. There was not a ditch nor a gravel road in the county. We went to Windfall by way of the Cow Bell route, to Sharpsville around the Crane pound, and two-thirds of the time we could not go to Elwood at all. Since then large open drains have been constructed all over the county. Nearly every farm is well drained with open and tile ditches and the swamps and sloughs have long since disappeared and the land was redeemed, and today they are the garden spots on this green earth.

It was twenty years ago, this year, when the first gravel road was constructed in Tipton county, and since then good gravel roads lead in every direction and the public can travel anywhere in any season of the year. With the opening up of ditches and the advent of free gravel roads, the forests began to disappear until today the swamps and sloughs are of the past. Well-laid and well-planned farms developed until all parts of the county are the pride of the people and the haven of the home seeker. After this ordeal of the clearing of the forests and the drainage of the lands, the people began to put on new clothes. They took on a new life and were filled with inspiration, aspiration, ambition, energy, enterprise, and became imbued with a progressive spirit that has wrought out the richest, the most productive, the most beautiful and grandest county in any State in the Union.

Generally speaking, the Tipton county farmer is intelligent and is well informed in science, in education, in religion and economic affairs. He has opinions and ideals and is able to express them. The Tipton county farmers live in splendid homes, commodious buildings surround him, and he has the latest improved methods of farming and mechanical conveniences. You can no longer distinguish the farmer from his city friend by the clothes he wears. The farmer is no longer a student. He is a teacher. The farmer's wives and daughters are dressed in the latest fashion and the town girl has no advantage over her in dress, in literature, in music or in art. The Tipton county farmer rides about the country in good buggies and fine carriages, which all go to prove that this is a mighty good county to live in and this a mighty good time to live in it. My observations are that the sluggard and laggard is rapidly giving way to energetic, enterprising and progressive farming. The sluggish farmer of today is the exception rather than the rule. All, or nearly all, have caught the spirit of progressive methods, and each rival and vie with another in the production of the best grain and the breeding of the best stock.

VIEWS OF FARMING FROM THE TENANT'S STANDPOINT.

MRS. BELLE C. HARDING, CORUNNA.

[Read before the Dekalb County Farmers' Institute.]

It is with no little embarrassment for me, a tenant farmer's wife, to stand before this audience and attempt to speak upon this subject in which so many are concerned.

I realize the fact, however, that I am not here alone today, but that tenant farming has become very prominent even in this prosperous land

of ours, yet seldom or never is farming viewed from the tenant's standpoint in gatherings of this kind. This is owing to the fact, no doubt, that when the tenant farmer finds a place on the program he is assigned some other line of thought.

It is, indeed, pleasing for those whom fortune has favored financially to listen to lectures, or read from their agricultural papers about the lovely large homes, with magnificent buildings, and every possible modern convenience that money can provide, with servants in the house and about the farm to lighten the burden of the tired mother and father, opportunities for educating their children and starting them out in life with an abundance of "fresh air, education and wealth to live near a large city and enjoy its society, church and entertainments," all this I say and much more that might be mentioned goes to make up the "bright side of farm life," but what of the class to which many of us belong who are deprived of most of these advantages? To be sure, we have the fresh air and perhaps, love and harmony predominate in our homes, but what of our environments generally? Some of us are not even so fortunate as to possess a home we may call our own, and while there are many disadvantages under which the tenant must labor, yet his lot is not the most unfortunate by any means if he manages his affairs in a business-like manner.

The first and all-important question for him to consider is to keep himself free from debt, which is not only good policy for the tenant, but for all farmers as far as may be possible, but the tenant who makes it his rule to pay as he goes is the one who comes out ahead, if any do. What can be more discouraging than to have a store debt, grocery bill, or hardware account to settle with each load of hogs or wheat or other produce sold from the farm? Those who pay as they go are well known by all merchants and business men generally, and should there be any chance for reduction of prices in their sales, or advanced prices in products, they are the ones who will be benefited by the same. Live not beyond your means and at the end of each year, even the tenant, if he has not met with unavoidable losses, may have a little sum laid up for a rainy day.

Another thing of importance for the tenant to bear in mind is to strive to keep on friendly relations with his landlord, for without co-operation there can be no success. This is not a difficult task, as there is always an article of agreement of some kind. Then the only thing left to do is for each to live up to that agreement in every particular. When a tenant signs an agreement he does not expect to comply with, he has not the spirit of co-operation within him and can please no man, and, as a result, the land owner is often accused of being a hard man for whom to work when the fault lies within the renter. And just here I wish to call your attention to the condition of so many farms which are to rent. They are all run down; buildings and other improvements dilapidated, fences, which only a few years ago would turn all kinds of stock, even the

pigs, are now lying flat on the ground, wire fences drawn up by the frosts until a yearling calf can pass under them into its neighbor's pasture; gates are hanging by one hinge or no hinge at all, barn doors are broken off, and old sheds tumbled down. Everything gone to rack, and for what reason? Simply because there is a misunderstanding somewhere between landlord and tenant concerning the article. If the landlord is to make all necessary improvements he should do so willingly, and should also furnish material with which to keep up repairs, but the tenant who thinks it is not his duty to rebuild fences his own stock or his neighbor's stock has torn down, or which has been blown to the ground by hurricanes, or who does not rehang gates and barn doors, is certainly anything but a home beautifier, and is not worthy to be called a farmer.

On renting a farm there are many points the tenant must consider to make a success of farming both for himself and for his landlord.

First, the size of the farm he is about to rent, which should not consist of more acres than he is able to handle successfully, for should he undertake a larger farm than he has teams, farming implements and labor to work, he can not make a success of it. To keep around him a surplus of hired help and purchase machinery he will not need on the next farm he occupies, takes from him all his profits.

Next, he must consider well the length of time for which the farm can be rented. No tenant can afford to rent a farm for one year at a time expecting each year to be his last on that farm, and no landlord can afford to rent his farm to any man in that way for this reason:

A renter moves onto a farm to stay one year; he will work that farm for all it possesses to make himself wealthier financially, and the land owner at the same time will get as good a bargain out of the tenant as his conscience will allow for the same object to make himself wealthier financially, thus robbing the land of its productive qualities, as no man can stock up a farm for one year's time or in any way build up the soil, and this being practiced year after year will ruin any farm. Then rent for as long a period of time as possible, say four, five or six years, or even longer if you can so agree, and then use the rented farm as though it were your own. Make it your home, beautify it, build it up, cause it to produce abundantly by using fertilizers and not work the fields year after year until they become unproductive and then move off because you can raise nothing by which to pay your rent. But this difficulty will not present itself often from a tenant who rents for more than one or two years at a time. With an agreement for a sufficient number of years ahead of him to encourage investments, he will supply himself with the necessary machinery to do his work properly and at the proper time, thus benefiting the land owner as well as himself by way of sowing, reaping and caring for his products in due season. Then, again, if he be granted sufficient pasturage he will invest what capital he can afford in stock which will

assist in building up the soil with one of the best fertilizers that can be obtained.

He should also consider the kind of rent he is to pay, which is, indeed, a very important factor. Should he pay cash rent, which seems to me to be the most convenient way to rent a farm for the owner, then the tenant must suffer all losses alone, or should the season be a very productive one, and his profits far exceed his expectations, then again he is alone in the good fortune. Considering these two extremes we conclude that the proper way to pay rent by which each shall share gains and losses equally should be by dividing the products raised; then, if the season be unfavorable, or from some other cause there be a failure in crops, each loses his share alike, or should there be an abundant yield, both landlord and tenant profit by the same. To be sure there is a difference of opinion prevailing among tenants on this point, but we have observed that too often where cash rent is paid the tenant must sacrifice his products at extreme low prices and even turn off his stock half matured to meet his obligation. Most of the hay, corn and oats must be sold instead of feeding it to cattle, sheep and hogs to assist in building up the over-worked soil, all because the rent must be paid.

In conclusion, we wish only to say to all that, in our opinion, it is far better to live on a rented farm, striving to accumulate a little fortune by which to purchase a home, than to be burdened by an overwhelming mortgage on a farm we call our own.

A FEW COMMON BIRDS AND THEIR RELATION TO AGRICULTURE.

R. M. HEAVILON, FRANKFORT.

[Read before the Clinton County Farmers' Institute.]

The old saying that "a little knowledge is a dangerous thing" is exemplified in the way that our birds are looked upon by a majority of mankind. The farmer thinks less about them than he does about any question that pertains to the farm or farm life. If he sees the crows or blackbirds in large numbers in his corn field, or the woodpeckers or sapsuckers hopping about over his trees, he thinks that they are doing harm and immediately shoulders the old shot gun and goes out to kill them. The birds suffer and likewise the farmer. As a practical illustration of this I sight an instance related by Professor Coulter in one of his recent talks in this city. He said that a farmer in Tippecanoe County came to him

and told him that he could not send his son to college this year. "How is that," exclaimed the professor; "a man that owns over five hundred acres of land in this rich county can't send his son to college?" "Yes, 'tis true," said the farmer. "I have had bad luck. Last spring I planted a large corn crop and the blackbirds were so numerous that I hired three boys to keep them out of the field. The ants and other insects worked on the corn so that it did not do any good. I planted again and added one more boy to keep away the birds. This time the cut worms cut it down. I planted for the third time but was too late to raise corn. So you see my circumstances." The professor answered the farmer by telling him that the boys destroyed the corn crop, for if the birds would have had their way the insects would have been destroyed. The professor encouraged the farmer to send his son to a college to learn more about birds as well as the other questions that confront the farmer.

Last spring we had a field of corn that was affected by small beetles eating the leaves and in some cases the entire stalks of corn. The blackbirds visited the field in large droves. At one time I counted two hundred. They stayed for three days and in that time disposed of most of the beetles. The corn that was not killed started to grow and the field made about two-thirds of a crop.

Whether a bird is injurious or beneficial then depends entirely upon what it eats, and when birds are suspected of doing injury to field or fruit-tree crops, a few birds should be shot and their stomach contents examined. This will unmistakably show whether the birds are guilty or not. Thus the practical value of birds is not generally recognized. It is an easy matter to kill all the birds in an orchard or a corn field, but it is a more difficult task to control the insect pests.

Perhaps the most common bird known to all is the sparrow. There are over fifty different species of sparrows, but their habits and plumage are so near alike that I will only describe them as a family. While sparrows are noted seed eaters they do not confine themselves to a vegetable diet. An examination made by the Department of Agriculture shows that one-third of their food consists of insects such as bugs, young grasshoppers and wasps. Their vegetable diet consists of hard seeds, the great bulk being grass and weed seed, while small amounts of corn, wheat and oats are taken. An Iowa writer, after careful experimentation, estimates the amount of weed seed destroyed by this bird to be one-fourth of an ounce per day per bird. His experiments were based on the snow bird and tree sparrow. Upon this basis and supposing that we have fifty sparrows per square mile, and that their winter ravage lasts 200 days, we would have a total of 5,566,050 pounds, or 2,783 tons of weed seed destroyed in Indiana annually. In this county alone there would be 62,500 pounds, or $3\frac{1}{4}$ tons of weed seed destroyed each year by this bird. These figures may seem large but they fall far short of what is actually the facts. Evidently there are more than fifty sparrows for

every 640 acres of land. I have seen them when I thought that there was one for every acre. Besides the weed seed they eat, the other hundred and sixty days they feed on insects and various other foods; hence their value can not be fully appreciated.

Passing to the blackbirds, we find that there are two kinds—the common, and red-winged blackbirds. Their habits are much the same. They eat oats, wheat, and corn in small quantities. From September to April, if they reside in cold climates, they feed on weed seed. In the plowing season they feed on grub worms, cut worms and other noxious insects. By experiment it has been found that nearly seven-eighths of their food consists of weed seed and injurious insects, indicating that they should be protected except in a few places where they may become too abundant.

There are few birds so well known as the common crow, and unlike other species he does not seem to decrease so rapidly in numbers. The crow is commonly regarded as a blackleg and a thief. He has been accused of pulling up sprouted corn, eating eggs and robbing the nests of other birds. Investigations show that the above charges are correct, but the amounts taken are small. On the other hand the loss of grain is offset by the destruction of insects. Crows eat weed seed, caterpillars, cut worms and mice. In sections where they are found in large numbers, the farmers resort to tarring the seed before planting, and the odor from the tar will prevent the birds from pulling up the grain. In general, a crow may be considered a farmer's friend rather than his enemy.

The meadow lark is a common bird which is well known to all the people of the rural district. It builds its nest on the ground and differs from other birds in that it is seldom seen sitting on green trees, but usually found on fences, dead snags and telegraph poles. This bird is almost wholly beneficial and the insects that it destroys are principally ground species, such as bugs, grasshoppers and spiders. The caterpillars are usually overlooked by birds that frequent trees, but the meadow lark finds them and devours them by the thousands. In the month of May, when the dreaded cut worm makes its appearance, the meadow lark probably does its best work. It is exposed to one danger, and that is, it is esteemed for table use and hunters kill them in large numbers.

Another one of our musical birds is the woodpecker, and he has just as much right to be called a musician as the drummer. Farmers look upon him with suspicion, and when he hops around over their fruit trees pecking at the bark, and fresh holes are found, they conclude that he is a harmful bird. But by careful observation it will be found that he seldom if ever leaves any important marks on healthy trees, and only when the trees are affected with wood-boring larvae that he dislodges the larvae and devours them. An examination of his stomach contents shows that from two-thirds to three-fourths of his food consists of noxious insects. Two stomachs were examined by the Department of Agriculture that were completely filled with ants, each containing something over 3,000

ants. Of course, this bird eats cherries and apples at some seasons, but the damage done in this way is small compared with the amount of good that he does.

It is customary to speak of small woodpeckers as sapsuckers, chiefly because they drill holes in the bark of trees and drink the sap when the pits become filled. One species—the yellow-bellied sapsucker—has been found guilty of pecking holes in sugar trees and then drinking the sap. It is also shown that besides this he catches the ants and other insects that are attracted by the sweet fluid and that the latter furnishes most of his food. Looking at these birds in this light we must say that the sapsuckers and woodpeckers are the only agents that can successfully hold the insects of the forests and fruit trees in check, and for this reason, if for no other, they should be protected in every possible way.

Most farmers have an ill feeling against hawks and owls. This prejudice is largely due to a lack of discrimination. Since they know that these birds attack poultry they do not stop to think that these depredations may be made by a few species but make a sweeping condemnation of the whole family. The reason is much the same as that of an Indian, who, being wronged by one individual, condemns the whole race. These birds should not be looked upon in this light, but as the farmers' friends. While hawks hunt by day, keeping the rats and mice in check, owls, whose eyesight is keenest, hunt during twilight and the early hours before dawn, capturing species which the former are not so apt to obtain. The meadow mice form the staple food for most of the hawk family. These mice destroy meadows by tunneling under them and eating the roots of the grass. In 1892 the southern part of Scotland was overrun by meadow mice and the farmers had what they called a mice plague, which was brought about by the killing of the hawks and owls. Just such an invasion might be expected here whenever these birds are reduced in number, and nature's balance will be wholly upset, and the rats and mice left practically without an enemy to control their increase. Besides this, hawks eat grasshoppers and crickets. A single hawk, as reported by the Department of Agriculture, disposed of 150 medium sized grasshoppers in one day. Entomologists agree that grasshoppers devour a quantity of food, equal to their own weight each day. Consequently if these grasshoppers had been spared by the hawks, the farmers of Clinton County would have lost several hundred pounds of produce.

On the other hand owls should be placed among the birds beneficial to man, although there are some species that prey on poultry. Their food is made up almost entirely of mice and rats, a few insects and occasionally a bird. We have two owls that stay in our barn, and I will venture to say that there is not a barn any freer of mice and rats in Clinton County than ours.

The Commissioner of Fish and Game, Mr. Z. T. Sweeney, has been watching the rapid disappearance of our larger birds. He is making an

attempt to introduce Chinese pheasants into Indiana again. To accomplish this he has sent sixty trios of these pheasants to sixty different farmers in Indiana. We received a trio with instructions to keep them the first season and at the end of that time, if successful in raising any, to distribute them among some of the farmers of Clinton County. So by this continued process it is hoped that in a few years there will be enough pheasants in Indiana to exercise some influence in helping to control its insects.

Now, while we have some birds that are injurious to mankind, the family of birds as a whole should not be condemned on that ground. How often are the services rendered to man misunderstood through ignorance? The bird of prey, the majority of which labor day and night to destroy the enemies of the farmer, are persecuted without cause, while that gigantic fraud—the house cat—is petted and fed and given secure shelter from which she may emerge in the evening and spread destruction among the feathered tribe. The difference between the two can be summed up in a few words—only three or four birds of prey hunt birds when they can secure no other food, while a cat seldom touches mice if she can procure young poultry or birds. A cat has been known to kill twenty chickens in a day, which is more than a bird would destroy in a lifetime.

Again, birds suffer from a different source. A noted sportsman boasts of killing 141,000 birds last hunting season for a millinery establishment. And just so long as the gentler sex continue to decorate their headgear or hats with birds, just so long will the sportsmen earn their bread and butter by killing the poor birds. Now, I like to see nice hats on our fair ones, but I think that just as ornamental and artistic hats can be made without birds as with them. If the wearers of such hats would only think of the havoc they are creating by this style, I am sure that a great many would cease to decorate themselves with one of God's creatures that was created for our benefit by assisting the farmer to keep the insects and vermin in check.

In conclusion let me say that if we want birds to live with us we should encourage them. The first thing to do is to let them alone. Let them be as free from danger as you or I. Take the hammer off the old gun; give pussy so much to eat that she will not want to hunt for birds; keep the boys away who steal their eggs and the sportsmen who kill them, for birds are the farmers' most valuable aids in his life long struggle with the insect pests. How important, therefore, that he should not destroy those that do him the greatest service.

UNAPPRECIATED ADVANTAGES OF FARM LIFE.

MISS ALMA WHALEY, STANFORD.

[Read before the Monroe County Farmers' Institute.]

"To see corn grow and blossoms set, to draw hard breath over plow-share and spade, to read, to think, to pray"—these are the things Ruskin says "that make men happy."

Yet we find many of the country people leaving the quietude of the farm and moving to towns and cities.

So many of the country boys are quitting the country work for the sake of working in town, where they are surrounded by temptations which too often they fail to overcome.

Parents, discourage this as much as you can; give the boys and girls something to see ahead of them in the future besides hard work and poor pay; give them opportunity for advancing intellectually and to live in a desirable social atmosphere. Show them how they may win fame as well as good homes by going to the top as farmers and they will not be so anxious to get into towns and cities to swell the ranks of hand-to-mouth laborers.

The countryman sitting by the beautiful fireside in the country is free from the bustle of cities and the noise of machinery.

People who live in the country have rich enjoyment, time for reading and making themselves acquainted with many facts.

How nice to sit at twilight hour holding pleasant conversation or listening to sweet strains of music.

Go to a quiet spot some clear morning and you will hear cattle lowing, dogs barking, farmers calling their stock, or perhaps the rumble of a far distant train.

The farmer has for his table the sweetest meats, the most delicious fruits, the newest eggs, the freshest vegetables, and upon the whole everything is nice and fresh.

Life in the country means freedom. If the farmer wishes to leave his farm for a little recreation, his grass will continue to grow, his cattle to fatten, or his grain to ripen, while on the other hand if the city man wants to leave he can not do so without a financial loss in some way.

But, some may say, the city people have so much advantage over the country people in the way of society, etc. We acknowledge they have the advantage in schools and churches if they only would use them.

Did you ever think of the great men of our nation and where they were from? Washington was a country boy the same may be said of

Lincoln, Grant and Garfield. The strongest minds and the bravest soldiers, as a rule, are reared in the country.

To love the country is to take an interest in all that belongs to it; its occupations; its sports and its improvements. To do this we must make the country not only the home of the body, but also the home of the soul. All of these things mentioned are but a few of the advantages that surround our country homes.

Just think with me for a few moments of the beautiful spring-time when all nature seems to be quickened and we see the trees become clothed with the beautiful foliage that is so verdant throughout the summer.

See that joyous finch perched on the apple tree that is all alive with buds and blossoms spreading their sweet odors far and wide. How happy he is with his breakfast in his bill, nor is he alone—one of his companions is drinking dew from the flower-cup just below. You can almost hear the flies buzz and the bees hum. The gay butterflies, like flying flowers, dance about in wild joy to the tune of the happy, happy springtime. All day the music is swelling in the fair blossomed tree; O sweet time; O fresh time; O May time; made for child-life, for bird-life, for love-life.

The wind whispers a promise that when the bees are all gone, when the birds fly away, the trees shall be laden with rosy-cheeked apples, for the full blossoms he has shaken.

ORGANIZATION.

MRS. C. W. MONTGOMERY, ROCHESTER.

[Read before the Fulton County Farmers' Institute.]

"United we stand, divided we fall."

Of all the organizations, combines, and trusts, of which we read, the farmer seems to be left out in the cold. He either has not been invited to join, or is indifferent to his best interest and stays out from choice. This reminds us of a little thing we read a few days ago. A man gave his son some candy expecting him to divide with his two little sisters. After a while the younger complained that the two older children had eaten all the candy and given her none. The father inquired into the case, when the son answered, "Well, you see, pa, we've formed a trust and the little one isn't in it." Doesn't this statement represent the farmer of today pretty well?

Should farmers organize? Well, if the farmer doesn't take care of

his own interests, who is going to do it for him? The wire and nail trust, the oil trust, the sugar trust, the leather men's league, are they organized for the farmer's benefit? Not that we have ever heard of, and we read the papers pretty thoroughly. No, we are never even thought of. We are counted as having no voice in the prices we pay for articles which are necessities to us. If the farmers expect to live in this age of oppression and industrial tyranny, they should organize.

As farmers we must protect ourselves. To become a power we must unite and battle with the monopolistic influences of the century. We must keep in the front ranks of the procession, for we can not afford to wait until the procession moves by, and then fall in the rear. We will be lost in this race for right against might unless we keep constantly abreast of the times and in touch with the things which interest and shape the destinies of the commercial, industrial and agricultural world.

Then why not join the nearest farmers' club in your vicinity, and work for the farmers' interests just the same as other business men are doing for their interests? If in every township, in our county, every county in our State, was a solid club of farmers, a club composed of our best farmers, whose pledge held them to vote, not for Mr. Jones, because he is a Democrat, not for Mr. Smith because he is a Republican, but for the man (regardless of politics) who will best do his duty to the ones who have placed him in power. One whose business will not be ruined if he sides with the temperance people, or could be turned from right by bribes. Do you not think such an organization would be a power in more ways than we care to mention?

It is often said, "O, you can't get the farmers to" organize. You might just as well say, did the farmer, stumbling along after his oxen and old wooden plow in olden times, ever dream of the farmer of today, with his good team, fine steel plow, and easy methods of doing farm work? Or did our grandmothers ever think that by just stepping to our doors we could carry our baskets of butter and eggs to the city on the electric cars? Did they ever think of daily mail for farmers or of our magnificent school buildings? Not many years ago farmers did not think they could have ice to use all through the summer; nor that refrigerator and oil stoves could secure comfort for the hottest days; nor that by the turn of a button a building could be made as light as the sunshine. It has not been many years that farmers knew they could form insurance companies of their own, and save themselves thousands of dollars by it, and have their building, grain and stock just as safe (and possibly more so) than in the old way.

Because a thing never has been done is no reason it can't be. Not long ago we farmers' wives thought the old hen all we had to depend on for our next year's batch of chickens, but we know better than that now; just fill the incubator with the eggs, light the lamp, and in the prescribed

time you have a nice lot of chicks, free from vermin; in the meantime the old hen has been scratching away and no time lost.

If we make up our minds a thing can be done, it can be. Where there's a will, there's always a way. Farmers are not given to saying, "I can't" in regard to other things. They dig and ditch, and clear and plow, harrow and sow, harvest and fence; nothing too hard or too tedious to make good crops, and there is an end of their independence. Now, the hard work is done, are we to allow others to reap a lion's share of our earnings, by just saying, we can't to any other way? By clubbing together, small farmers can ship car-loads of products to central markets, and secure the very best price for same, and avoid middlemen's profits. There are dealers almost everywhere who make a specialty of handling farmers' grain and stock direct, and we should know where and who they are. In short, the farmer should learn the lesson of combination from the numerous trusts that are being formed all around him, and lessen competition as far as possible. We have stood in the background so long the world don't know we have rights, which they would have to concede if we were thoroughly organized. We believe farmers are gradually coming to see, and admit, that organization is not only a privilege that may be employed for social benefit, but that it is also a necessity of the times to enable them to stand up against the aggressive movements of other organized interests. Recently a mass meeting of farmers was held in eastern Illinois for the purpose of forming a farmers' grain shipping association. Over one hundred and fifty farmers were present. As a result of the meeting a committee of five was appointed to secure articles of incorporation. The company will be known as the Hay, Grain and Coal company, and will erect a large elevator.

Financial success is of first importance to the farmer the same as to other people. Upon this depends the education of his children, the books he may have, the travels he may enjoy, and all the helps which contribute to a higher social standing. Anything that can be done in a lawful way to help farmers retain a greater share of the benefits of their own labor, for these worthy purposes, should be done. We should organize to learn business methods, so that we will know as much about buying and selling as cultivating and harvesting. People in other parts of the world recognize this fact and are taking advantage of it. The Germans, having realized that by proper organization they can keep within the German border the thirty million dollars which the people of the empire now pay to foreigners for poultry and eggs, they have formed a club for the purpose of developing a home poultry business; egg depots are to be established in the principal cities, and the people are to be supplied with eggs, the good quality and the freshness of which will be absolutely guaranteed. This system will give confidence to customers, and at the same time give poultry raisers a more certain and quicker market for their product than they could otherwise secure. In order that bad eggs

may be traced to their origin, each poultryman is required, before sending his eggs to the depot, to mark them with a sign previously agreed upon, which will designate them as fresh eggs, and their source. For each egg sold which proves inedible, the purchaser is entitled to receive fifteen fresh ones without charge, and the products of the egg raiser are to be excluded therefrom for a stated period. There are also township clubs, where they meet to discuss the results and errors of the past year's work and lay plans for the coming seasons, with the idea of avoiding the previous year's mistakes, and making the best uses of its successes, and the indications, from the experiments which are made each year on a small scale. The farmers tell their own experience, and put some brain work on the result of their local experience.

The ideal organization for farmers is one where business is combined with literary work and where the farmer and family can all go and spend a social time together. One incentive to the forming of a club is that it makes better farmers. One member is an experienced fruit grower. He knows just how to treat trees and vines to get the most fruit from them. He understands about insects and what to do to destroy them, how best to market his product and save for home use. Another is an adept at raising fine hogs. He has experimented along this line until his experience is of great value. Still another is a successful clover grower. As these things are freely discussed at each meeting, questions asked and answered, they are especially valuable to young farmers, and gratifying to the older ones. Another plea for organization is, it tends to break the monotony of farm life. And right here is the one great drawback to farm life. Who cares how hard his work if he has something bright and cheerful to look forward to at the end of work time? We, none of us, work for pure love of it, but for the reward of our labor. Our thoughts are taken from every day life, and we have something to think of beside just drudgery. It is a stimulus to mental development for both young and old. It develops a feeling of fraternity and good will among the farmers and gives them greater confidence in themselves and in each other. Farmers would benefit themselves greatly by meeting together to talk over matters of mutual interest from time to time, and by mutual counsel come to a more correct understanding about the management of their business, and the best methods of carrying on farming operations of various kinds, stock raising, feeding, etc., and the hundred and one subjects of more or less interest to the profession. The institute comes but once a year, and then only one in ten of the farmers could attend if they would, on account of the distance, and those who are present may not hear the subjects discussed they most need to be informed upon. The programs are made by others, and often to suit the particular speakers who are available, whereas, a club or organization can hold weekly meetings and discuss any or all subjects of farm interest. The institute is a power among farmers for good, but there is too little of it and it is enjoyed by too

small a number of us. Two days out of 365 is merely a drop in the bucket compared to our needs. It is impossible to estimate the amount of benefit that would accrue to the farming communities of the country if clubs could be organized in every neighborhood or township. And there is nothing to hinder such from being formed if the farmers could be induced to see the value and necessity of same. There is an organization being formed in many places in our country, which is the oldest, as well as the best one in existence for the farmer and his family. To this one we owe free mail delivery, farmers' mutual insurance, and much else enjoyed by its individual members. It is the largest farmers' organization in existence, and the only one large enough to exert any influence on our lawmakers. But it is not yet large enough to defend the farmers' rights, and can only become so by every farmer lending a helping hand, by joining, and maintaining that the farmer has just as much right in law-making and in organizing as any other class of people.

GOOD ROADS.

JOSEPH HEAVILON, FRANKFORT.

[Read before the Clinton County Farmers' Institute.]

To each epoch in the progress of civilization is given a live question to solve. The great question of the twentieth century is the annihilation of space by means of improved method in the transmission of thought, power and materials. By means of the telegraph and cable all parts of the earth are brought within hailing distance of each other, so that when one part is suffering for food another part may be thinking about the same a few hours later. But the sending of food to their relief involves the question of good railroads and turnpikes, the latter of which I will speak. The road is essentially a commonplace thing, a part of the every-day routine of the struggle for existence, and yet it is true that roads and civilization go hand in hand. The transition from the nomadic, pastoral and semi-barbarous manner of life to a commercial and trading civilization is marked by the construction of roads. The history of Rome, ancient India, and Peru prove this statement. All historical accounts of roads begin with the famous Roman roads. Whenever the Roman armies penetrated into Africa, Spain or Gaul, they spent considerable time in the building of roads which may be seen today. The same was true of France when Napoleon was on the throne, hence road-building and civilization undoubtedly go hand in hand. The agitation for good roads thus rests on two distinct bases—business or economy in transportation, and pleasure.

Looking at the money consideration of it, I think we will all agree

that good roads economize time and force in transportation of products between farmer and city; enables one to sell and buy at any time of the year, thus taking advantage of the fluctuations of the markets; reduces the wear and tear of horses, harness, and vehicles; and also enhances the market value of real estate. The improvement of roads raises the value of farm lands and farm products, beautify the country through which they pass and aid in free mail delivery. It is estimated by the National Farmers' Congress that the wagon transportation of the country amounts annually to 500,000,000 tons. This has to be moved an average distance of eight miles; it costs an average of \$2 per ton to move it, which is 60 per cent. more than it would cost to move it if we had good roads all over the country; or an extra cost in production and marketing of our agricultural products of \$600,000,000 annually, and when we consider that the total annual value of our crops is but \$2,500,000,000, we see that practically one-fourth of the home value of our farm products is lost by bad roads. Thus the difference between good and bad roads is equivalent to the difference between profit and loss. Good roads, then, have a money value to the farmer, and looking at them only from the "almighty dollar" side they are found to pay handsome dividends each year. The interest of towns and cities in good roads is easily demonstrated, and, in many cases, is already well understood by these communities. The whole people have equal rights on the country roads, and those living in cities and towns have often greater need of them than the farmer, who, at a pinch, could live upon what he raises, while the cities raise nothing and could not live a day without country roads. The farms of the United States comprise less than one-fourth of the total property of the country, yet that small fraction pays the whole cost of building roads. The injustice of this system, which we have inherited from the old countries, but which was abolished there many generations ago, is not yet fully appreciated by the farmers of this country, and the greatest difficulty now experienced in road improvements is in getting the farmers' consent to have this injustice wiped out and inducing them to accept the aid which cities and towns are willing and anxious to give to the general improvement of the highways.

Turning to the pleasure side of the question you will readily agree with me that the old saying of Charles Sumner is true, that "the road and the schoolmaster are the two most important agents in advancing civilization." It is not necessary to state that in those localities where good roads have been built that the people are becoming richer, the country more thickly settled, while in those localities which do not possess these advantages, that farming is almost at a standstill or becoming poorer, and, in some cases, the land is becoming barren. In these sections life on a farm often becomes void of social enjoyments and pleasure, the people of such sections suffer such great disadvantages that their ambi-

tion is checked, energy weakened and industry paralyzed. Good roads, then, like the good streets of your city, make the habitation along them most desirable. Besides this they are a potent aid in education, religion and sociability. Out of the 1,000 wheelmen in Clinton county all like to take a spin on their wheels in the summer for pleasure, and nearly all country pleasures, sports and amusements depend on good roads. Every one of these wheelmen is a preacher in season and out of season of the gospel of good roads.

Whenever a road is desired to be improved in any section of the country a designated number of land owners adjoining and abutting the road petition the commissioners of the county for such improvement. Upon their petition viewers are appointed to examine the premises and report. If their report is favorable for the improvement, an assessment is ordered; each forty acre tract or fraction thereof for one mile and one-half on either side and on either end of the improvement is assessed so much benefits or damages as the case may be. The width of the road is determined, a competent civil engineer is selected to draw specifications and make all needed surveys. He approximates the cost for the viewers. Published statements are made in the county paper of the construction of such a road, and on a designated day bids are received and the contract let, usually to the lowest bidder. A superintendent is appointed, and work begins. In regard to the width of the road not much need to be said except that main thoroughfares should be at least fifty feet wide; commoner or less important roads, forty feet wide. The narrower the road less will the amount of work be to keep down the weeds and more land will the farmer have to cultivate. After the road has been contracted next step in its construction is to grade it. Before this can progress very far all perishable material, such as stumps, brush and vegetable matter should be removed from it, and the resulting holes filled with dirt. The grade should be gradual and high enough in the middle to readily shed all of the water into the side ditches; if the side ditches have plenty of fall and the stock are kept out of them they will frequently carry the water away. But too frequently water is the destroyer of roads because the material is more or less susceptible to the action of water, hence more easily destroyed. Possibly the best way to drain a road would be to run a tile drain in the bottom of one of the side ditches along the road, and then cross the road at designated points with sewers, connecting grade ditches. After the grade has been brought to the proper height, and when road-bed is thoroughly packed, it is ready to receive a coat of gravel. As to the character of the gravel it should be the best that can be obtained, free of rock, stones, soil, or clay. The width graveled should be twelve feet; eighteen inches high in the center and fourteen inches at the sides. This makes the crown look full. And this sheds the water readily. It should be carefully watched and all the holes kept filled until

it is thoroughly packed. The grade and ditches on either side should be sown with some good grass seed, and later in blue grass. The object of this is to hold the grade in place, and, also, prevent weeds from growing along the road. After good roads have been established the next question is, when and how should they be repaired? The best time to begin the repairing of roads is in early spring just after the frost has left the ground and the road is thoroughly settled and dried. The secret of good roads lies in the repair of them; keep the water ditched off of them, keep the ruts filled with gravel, the center full and the culverts in good repair, for the neglect of any of these soon destroys the good qualities of the road. In regard to the management of a road, some very grave questions present themselves which are admirably answered in the statutes of the road law of Indiana. Here are a few of them: Can a man hold lawfully a part of the road after having it fenced in ten or more years without any one complaining? Can teamsters haul heavy loads over our gravel roads in early spring in wet weather? Can a man ditch across the road at will? How about traction engines running over bridges and mashing them down, crippling the engineer? Who suffers the loss, or who is liable for damage? Suppose there were a fine curly walnut tree growing along the road? Who owns it, the owner of the adjoining land, or the township? Can gypsies camp along the public highway? Can a man's stock pasture the roads at will? How if they be herded? These are all good, practical questions which every farmer ought to know and which should be touched upon to some extent in the general discussion. In conclusion, let me say that Clinton County has about 1,500 hundred miles of roads, 364 of gravel, the rest of dirt. Most of the dirt are in bad condition, some impassable. Why not gravel all of them and put them on the same plane? Some say that roads do not increase the productive capacity of the soil but add more to the taxes. Let us consider this plausible objection. Suppose the increase in appraisement of land where roads are improved to be \$4 per acre, and the rate of taxation to be $1\frac{1}{4}$ per cent., this would mean an annual increase in taxes of five cents per acre or \$5 per hundred acres. Is there any one who would rather live in mud than to pay this meager sum for the benefits of good roads? If there is, he ought to sell out and move out in the wilderness where the spirit of progress will not disturb his quietude. After getting good roads see that the noxious weeds are kept off of them, that they are well set in blue grass, and then adorn them with nice shade trees, and thus emphasize the old adage that "a thing of beauty is a joy forever."

OUR HOMES.

MRS. MICHAEL YARLING.

[Read before the Shelby County Farmers' Institute.]

Ladies and Gentlemen—I have listened with pleasure to what has been said by Mrs. Erwin. She certainly has given us some beautiful suggestions on making the home and surroundings pleasant and happy. I do not know that I can add much to what has been said, yet we all know that every housewife has peculiar ideas and notions as to how to best arrange her furniture, draperies, bric-a-brac, flowers, etc.

We all know that warmth and comfort should be the key-note in arranging and furnishing of the living room. Here we usually pass the most of our time, either alone or with the family.

This room should be well furnished with a variety of good pictures. Family photos enlarged, both of the living and of those who have passed on before, should adorn the walls, and they should be arranged in as neat and tasty a manner as possible. The draperies for this room should be strong in color and the ceiling should be tinted either in a light yellow or old rose.

The sleeping room will admit of a greater scope in the decoration and furnishing than is possible in any other parts of the home. gaudy and pretentious effects in the room are seldom attempted. Harmony should be obtained by the variation of one dominant or principal color—this to suit the taste of the occupants. Portraits of friends can be used in this room to great advantage, articles for the toilet usually occupying considerable space.

Cleanliness and convenience should be the key-note to the kitchen and pantry. There should be a place for everything and everything should be kept in that particular place. The practical and up-to-date housewife always manages to keep her kitchen in as presentable a condition as her parlor.

The repast is always enjoyable and relished, when served in a well-lighted, well-arranged dining room. The meals should be well cooked, neatly dished and quietly served in a hospitable and social manner.

The parlor is the most expensive, least used, but still a very essential adjunct to the home. The young people could not dispense with it most of the time. Curtains are drawn to keep the strong sunlight from fading the carpets, draperies, etc. This room is usually furnished to suit the wishes and purse of the occupant. It may be in an expensive and costly manner and yet not in the best of taste. Others again with much less

money but with better taste, produce a more handsome and attractive apartment.

I do not care to take up further time referring to the halls, stairways, porches or lawns, but will add a few words in relation to the books and papers, periodicals, etc., that should be kept and used by the boys and girls in the home. They should be of the best and purest, possessing a high moral tone, in line with the teachings of christianity and morality. The lessons thus taught will ever remain with the recipient and as age grows apace it will help to form correct Christian ideas and be the means of making not only themselves better and purer, but will have an influence for good in the community where they live. Good men and good women are made by these early pious teachings. The first impressions are lasting and are good ones to live by and better to die by.

HEREFORD CATTLE.

C. E. AMSDEN.

[Read before the Shelby County Farmers' Institute.]

I have listened with considerable pleasure to the address of Mr. Douglas. He shows very plainly the advantages of not only raising the best quality of cattle, as well as the class or breed which he shall handle.

I feel he has very plainly presented the matter for your consideration; yet, to my mind, and actual experience, I have come to the conclusion that for general purposes, the Herefords are the best, and that more can be realized from raising them than from other classes of beef breeds.

First I have demonstrated that they can be kept and fed on fully one-fourth or 25 per cent. less feed, that they are more lively and will do more hustling for their feed, and more active, and out hunting for something to eat, while the inactive and lazy "Short-horn" are quietly reposing under the shade of some neighboring tree. I frequently notice also, in the cattle markets, reports that the Herefords sell for from 30 to 60 or 70 cents more per hundred, and in public sale, it is a well-known fact that they bring from \$50 to \$150 more per head than any class of "Shorthorn." At the cattle sale at Kansas City, in March, of 1899, the difference was more striking than this. At the average sale, per head, of forty-six head of the Weavergrace herd, amounting to \$516.10 per head; forty-nine head of the Fairview herd, amounting to \$383.00 per head, and thirty-eight head of the Grant Hornaday Live Stock company, amounting to \$350.00 per head.

I have the facts here before me. If there is any doubt of the correctness of my statement, I do not want to be considered an expert in this

matter. My whole aim is, and always has been, to induce the farmers of this country to feed and sell the best cattle, for they always pay the best. I am fully a beef-breed man, and believe that the Herefords are the best of that class for the farmer.

MOTHERS ON THE FARM.

MRS. J. J. WHEELER, ROME.

[Read before the Perry County Farmers' Institute.]

The subject was first suggested to my mind through a spirit of criticism, for in looking over the list of subjects for speakers we find that the farmer, with the boys and girls, are to be instructed, their amusements and future good considered, but the mothers are left out.

As we wish for the greatest good for the greatest number, the failures of mothers in her sphere on the farm should not be overlooked.

For tilling soil and reaping the harvest, machinery has greatly lessened the labor until one man can do the work of many.

We know that no machinery in our reach will bring in and prepare the vegetables for dinner, wash the dishes and do the mending, but we might have more of the labor saving devices than just the sewing machine. She, too, should have improvements for her work to enable her to throw off the cares of the home if only for a few hours.

The mother's duties are so many and so varied, but when food and raiment are prepared and distributed that is far from fulfilling her mission. The more important part is the training of the children for a life of usefulness. It is as much a duty to teach industry and economy as to provide food and clothing, and that labor is not only profitable but honorable.

They should not be spoiled by waiting on them unduly, but teach them to take care of themselves and do things by themselves.

The most deplorable cases of failure in training that I ever saw was where the children were made to believe from infancy that they were a little better than any one else, and that they were entirely too good to work. This ruined the ones that I have in mind, and I would not like to trust one of my precious ones to such training.

In a family where there are both boys and girls, a disturbing element is the fact that the boys have more privileges, more chances to make money, to see the world, than the girls. It is no use to recite to them the old grammar parsing sentence, "Whatever is, is right." They don't believe it, and, as it has been one of the unsolved mysteries of my life, I can't blame them. The nearest a solution of this problem we have ever reached

has been to have an equal division of the proceeds of farm products that are given to children between those that work indoors as well as out.

I believe that many girls are not taught the true value of money. They must know how to calculate and to realize that when money is once spent it can not be spent again, that is, that receipts and expenditures must at least balance (unless there is an unlimited supply), or there will be worry and embarrassment from debt.

Then children are prone to procrastinate, and this is one of the difficult things to combat. If they can just wait a little while before obeying, maybe they can get out of it altogether—too many times they do this.

I have tried to teach my children to revere great minds. I often give them Horace Greeley's saying, "the way to resume is to resume." And the way to get things done is to do them without unnecessary delay. They often tell me they wish I had never heard of Horace Greeley, but all the same they have the principles planted in their minds and I hope they will in after years appreciate its value and be richer in life's gifts from having learned it while young. Don't expect too much of children or be disappointed if they look on work as a penance or just for profit without understanding that it disciplines them for the future.

The worst failure of the mother is neglecting to care for herself by taking exercise in the open air. Instead of toiling over gusset and seam of the olden time let the gusset give way to the new pattern and the seam be as short as sewing machine can make it, for with each passing year new tasks are added until the impossible confronts us. This is the time to decide on the most important duties of life, and leave to others what we can no longer do. We must realize that our mantle must fall on other shoulders, usually that of our children, and leave off unnecessary work in order to keep up with the age of improvement, for in this progressive age this must be done or she will sink into imbecility.

I heard a lady of about sixty years say: "I have so much to do and I have to stay at home so close that I have not half sense and I don't care for anything." It is as much a mother's duty to improve her mind as her children's, and by so doing she will leave the example as well as precept. Then, by throwing off some of the cares and duties in her line, they will become resourceful and self reliant.

The mother is too apt to stay indoors too much for health. Light employment out of doors in summer and a brisk walk several times a day in winter when the sun is shining, is a cheap nerve tonic that all may enjoy. Get all the air and sunshine out of light household duties possible, and if you can cultivate for profit, all the better, but let the work be congenial. If you don't like to work with vegetables and berries, let it be flowers or chickens--anything that will take you out into the sunshine. Then let the world go as it will. "Don't worry," for if we weary not in well doing "we shall reap, if we faint not."

THE SECRET OF A HAPPY HOME LIFE.

MRS. HELEN BARROWS.

[Read before the Knox County Farmers' Institute.]

"Keep thy heart with all diligence; for out of it are the issues of life."

I do not undertake to give any insight into the mysteries or problems of life. Nor can I give any key to our career.

"For we are the same our fathers have been,
We drink the same stream, we see the same sun.
And run the same course our fathers have run."

But we should not cast upon the community our crude hopes, our mistaken ideas, our illusions, and allow these things to become the heritage of those who live after us; for only as we fulfill the right conditions can we hope to have the effect produced.

We know that all over the earth are myriads whose life work is that of mental worry. Their souls are sad and their hearts are deep with discontent. Yet the breath of their life is dear to God.

Their place in the world is a right one, a needed one, and should be a happy one. Christ said: "I came that ye might have life, and have it more abundantly."

Many a man today climbs a ladder with a hod on his back, and sings praises to God. While beside him, in a home gilded and glittering, arise curses from his fellow man. So, often is it true, as the temporal blessings strengthen, we lose that condition, that faculty, which makes us content, which makes us happy.

The inaugural wardrobe of Mrs. McKinley was said to be the most magnificent ever displayed in Washington society. The cost of the costumes was between \$8,000 and \$10,000. They were pronounced by those who viewed them to be the best creations of the art of dress-making ever attained in this country. The material was cloth of silver, the ground work of white satin, heavily brocaded with silver thread in the design of a lily. The right side of the skirt was slashed half way up, and under that an embroidered skirt of pearls. She wore a number of diamonds to fasten the front, the handsomest being a diamond star of unusual brilliancy.

Yet it was said that this elaborately dressed "first lady of the land," after the reception, threw her soul into that verse of Florence Percy:

"Backward, turn backward, Oh, Time in your flight,
Make me a child again, just for to-night."
"Rock me to sleep, mother, rock me to sleep."

I was once asked: "What impressed you most at the World's Fair?"

I readily answered: "Maud Muller." I had always liked the poem, but when I saw Maud with my own eyes, her hat thrown back, and the expression on her face that she wore.

"(But) when she glanced to the far-off town.

* * * * *

"The sweet song died, and a vague unrest
And a silent longing filled her breast,
"A wish that she hardly dared to own,
For something better than she had known."

The first I knew I was actually shedding tears, so true, so lifelike was that marble image.

And oh, how many of us sigh for "something better than we have known." And we long to marry a judge rather than be happy with our own raking of the hay.

What peace might come to us if we could say with the Apostle Paul: "I have learned in whatsoever state I am therewith to be content."

A few years ago, when visiting a friend in the city, we were invited into the home of a wealthy traveling man, and while out driving in their handsome turnout we went beyond the city into the country, and chanced to pass a small log house where were a man and his wife milking their cows. The gentleman in the carriage turned to his wife and said: "Anna, that's the way we started."

Then turning to me he added: "I would give all I possess to be back in the old house, back in the old life."

And I thought an hour later when the husband, by mistake, placed their guest with her back to the handsome sideboard instead of facing it, as his wife had planned, that such discord could never have occurred in the cabin.

We allow the longings of our hearts, and the environment which wealth brings, to absorb that ineffable charm which may glorify the lowliest hut, or fill the most wealthy palace.

It is not money, but "the love of money" that is "the root of all evil."

The immortal soul must give itself to something that is immortal. "Now, abideth — faith, hope, love. But the greatest of these is love."

OUR BOYS AND GIRLS.

MRS. CARRIE JONES, TERRE HAUTE.

[Read before the Vigo County Farmers' Institute]

It would take wisdom of Solomon, the patience of Job and the firmness of a rock backed by divine grace to raise a child just right. Now none of us have all these characteristics but those who have gone over the voyage many times have learned from their very failures how to point out the shoals and quicksands that the inexperienced must come in contact with. It takes everlasting vigilance, and a mistaken idea of many people is that the way to train them is, tell them to do or not to do anything, and if they disobey you beat them. My friend, there is something radically wrong in your method if your child has to be whipped after he is old enough to reason.

First we should find out what kind of men and women we need, for very soon our boys and girls will be men and women.

To-day girls in almost every position in life are wondering what they will do for a living. How shall they go to work to do this? Not by dreaming all day long. There is only one thing to do, have a fixed purpose and stick to it. Paddle your own canoe, has come to be just as much of a motto of girls as of boys, and be sure girls that you are paddling it into the swift current of your noblest inclination.

Nobody has confidence in a slipshod man or woman. Take a look into the home of a slipshod woman, a woman who half does things and see how contagion has spread to all of her children, half finished work, confusion, disorder and discomfort are everywhere visible.

The practice of mothers doing all the work and letting their daughters spend their time in reading, music or painting is so prevalent, even among farmers' wives, that it is high time their eyes were opened to their mistakes. Train your daughters to be housekeepers and in time they will rise up and call you blessed. The farmer ought to so educate his son that when he becomes the head of a household he is fully competent to take entire charge of his farm, then it is a great disappointment to him if his wife can not prepare an appetizing repast.

What shall we do with the boys of our household and what shall we train them to do with themselves?

I hope no one will answer as I heard a father say: "Oh, let him alone, let him come up naturally, he will make blunders and mistakes to be sure, but he will learn by them. Do not vex him with training and restraint, with objections and advice, his future will take care of itself." I beg

to remind you that we do not take that course with anything we are accustomed to raise or rear. We will not allow cattle or poultry to grow up as it may happen if we are aiming to make a success of raising them.

All boys have appetites and passions common to humanity, these should be their servants but never their masters. To them come such temptations as their fathers and grandfathers did not know.

They could walk the streets of our great cities without being enticed by ten thousand saloons, gambling hells and houses of vice made attractive by art and wealth, and all under the protection of the law. Fathers and mothers, don't you think it high time that we begin to run our cultivators and dig out the weeds that are ruining our boys, both morally and physically.

I have no doubt that most of you will dispute me when I say that boys should have a careful physical training. It is the girls I am told that need the physical training, look out for them! They squeeze themselves into mummies with their glove-fitting corsets, they bandage their feet to the proportion of Chinese women, they weigh themselves down with heavy skirts and live so artificial a life that there are few healthy women in this country; while I am not ignorant of the physical dangers which beset our young women nor indifferent to them nor silent concerning them. I still contend that our boys have need of a careful physical training.

When Dr. Hammond, that superb ex-Surgeon General of the United States during the Civil war, positively asserts that no young boy or growing man can use tobacco without permanent injury, I am sure that no one will deny that I am correct in asking for a better physical training for our boys than they have.

I am afraid a new standard has been set up in America. We too often think that everything must be measured by its money value. Will it pay? What is there in it for me? These are the great interrogations of the century. I think it most unfortunate that our youth are brought up to look upon money as the great measuring line of values. Does it pay to stop a boy's growth just when he is expanding into manhood and take him out of school and college, because for a time he can earn a little more money.

I don't believe property is ennobling and that is the reason why I have an immense amount of respect for the man or woman who works. I don't mean cheat, lie and scheme to get rich, neither do I mean to just work a certain number of hours in the twenty-four. I am opposed to the eight hour day. If we can get our work done in eight hours that is all right, but let us be sure our work is done.

A little foresight, a little self-denial, a little surrender of pride for the sake of honesty, a little generalship in small things will bring many from the ragged edge of poverty to a comfortable living. Advice is thrown away on boy or girl who considers it beneath them to work at anything

that hardens their hands or soils their garments, but who prefer a clerkship in a store or office at starvation wages. There are those who have not the courage to live within their means. In their pride they try to make a show and they don't know what economy means. The mere change that many throw away make all the difference in independence. Give me the tobacco and chewing gum money of this country and I will keep all the poor in it with comfort.

To make an appeal to the fathers of this country, what we ask of them is, that they assume without delay the responsibility which belongs to them in the training of their offspring. To leave this work wholly in feminine hands is both wicked and heartless.

Let us govern our children rather by the force of character, by the interest we show in their welfare, and by the words of love and encouragement we lavish upon them than by fear. Oh, fathers, you must teach your children! You must plead with them as undoubtedly Abraham of old did with his children. There was something about Abraham that must have been very helpful in the training of his children.

To find out what this was, look for a moment at what kind of life he lived, see his hospitality to strangers, see him as a peacemaker, note also his loving devotion to his wife, Sarah. He was just towards his fellow creatures and he was true to his God. If it be important that we give wholesome instruction to our children, how much greater moment is it that we live right before them! What will you take, was asked of a young man out in company with his father and others. I'll take what father takes, said the young fellow, and happily the father, brought to his senses by the reply, said, Then I'll take the water. Oh, yes; they will nearly always take what father takes, will almost always feel that they can do with safety and propriety what father does. Therefore it behooves us to bend every energy of the human soul to the accomplishment of this purpose.

Training the young immortal souls in a manner that will be pleasing to the Master, and may He give us strength and wisdom and patience to overcome every hindrance to the stupendous work so that we may stand approved before the great white throne at last.

THE UNEXPECTED GUEST.

MRS. C. E. BLACK, ORCHARD GROVE.

[Read before the Lake County Farmers' Institute.]

Much has been said of the manifold duties of the farmer's wife. In the first place she must have a love for the life she leads, attend closely to every part of the housework, put cheerfulness and sunshine into the home, practice contentment, economy and thrift, carefully regulate the manner of living and expenditures of the household. She must be ready to give encouragement and counsel to the weary toiler as he comes home at nightfall, to be progressive, taking an interest in the school, assisting in the moral and mental training of her children. She must be young in heart although there is a plentiful sprinkling of "silver threads among the gold," not forgetting the duty of self-preservation, by which I mean having regard for one's personal appearance as well as laying up treasures in the storehouse of the mind, and keeping pace in knowledge of what is going on in the world.

These are a few of her duties to her home, her husband and her children, but what is her duty toward the unexpected guest?

These facts do not, by any means, prove that we have no time left in which to satisfy and develop the social part of our natures, but they are enough to show that when an unexpected guest arrives no apologies for anything amiss are called for.

Some of us are familiar with homes where, upon entering, a series of apologies are begun and only ended when we bid them "Good-bye." If we have gone to take a meal with them, it will be seen at a glance, on being seated at the table, that everything looks tempting, but are informed that this last baking was not as light as usual, the coffee is not quite as good, the pickles are not as sour or the pie as sweet as they should be. And all this precious time is spent in apologies instead of in pleasant and elevating conversation.

When I commenced this essay I was tempted to begin with an apology, knowing that the best effort of my pen would be poor indeed, but, foreseeing this last paragraph, I refrained, resolving to "practice as I preached."

One summer I passed some weeks in a home where the family was of considerable size. We were welcomed into the family circle and it seemed to us always as if our presence did not necessitate more work, but each pursued their individual duties. The mistakes of the fifteen-year-old girl who prepared the dessert for dinner each day were never

referred to, thereby encouraging her to persevere, and our food tasted just as good as if apologized for; sweet peace prevailed, and the lesson was one never to be forgotten.

I know a lovely silver-haired lady who invariably meets her friends and acquaintances with the warmest of welcomes. It happens many times that unlooked-for visitors find their way to her door a short time before dinner. Her work may not all be done, and perhaps no preparations are made for a meal, but as she sees them coming she gives them a cordial welcome, then afterward looks after the dinner.

Her affectionate greeting is an inspiration in itself; the guests there do not have an uncomfortable feeling as if they should have sent word or come earlier, or not at all.

We should all remember that there are other things in life besides attending to physical wants and that a good appetite makes a feast out of the plainest fare, if it be well prepared.

We know that a lack of system is to be sadly deplored, but we do not believe that health and home happiness should ever be sacrificed for system. We have often observed that the strictly systematic housekeeper (the extremist) and the true home-maker are not the same person. In the family where there are several small children it often happens that some piece of work we would prefer to have done must be left undone in order to give the mother a much needed rest, to gain a little time for reading or take a walk with the children.

The guest need not contrast this condition of things with her own immaculate housekeeping. The amount of work to be done, the number of persons in the family, the conveniences, etc., might not compare.

The experience of two persons are never exactly alike. In order to sympathize truly with another in their circumstances, we must—from the suggestions of our experience—imagine ourselves in their place. This sympathy doubles our pleasures and divides our pains; it is worth striving for since the sympathetic alone are fit to live with.

Having referred to some mistakes which the hostess makes, we will mention a few errors of the guest.

She frequently compares her house and belongings to that of her hostess; she is not appreciative and uninterested in what is done for her pleasure.

She ridicules the school entertainment or the neighborhood gathering to which she has been taken, at the same time knowing her hostess was not responsible. She does not appear promptly at meals, but keeps the family waiting; she invites herself into the kitchen to watch her hostess cook; she criticises her friend's cooking and compares it with her own improved methods; she finds more or less fault with her friend's clothes or domestic customs.

Whether we are the ones who visit or are visited, may we, as hostess,

be free from agitation, gracious, easy in manner, always inclined to welcome our friends and make the best of everything, or, as guest, try in every way to fit ourselves into the home we are visiting and to be a cheery, happy, helpful factor in its life.

OUR DAUGHTERS—WHAT SHALL WE TEACH THEM ?

MRS. S. J. GUNKLE, MULBERRY.

[Read before the Clinton County Farmers' Institute.]

According to the dispensation of an all-wise Creator, no member of the human family lives entirely independent of others, or for self alone. We are all more or less interested in the welfare and conduct of those we come in contact with, be they friend or stranger. We may boast of our talent, of our wit and wisdom, of our health and strength, and even of our wealth and influence, and yet, what does it all amount to if there is no kind friend to care for us in sickness, or when old age renders us dependent on others to make our last days of life comfortable? Then, if at no other time, a kind, loving daughter is appreciated.

There is no one who is not interested in our American girls, those girls who are so bright and active, who are so full of pent-up energy; those fun-loving girls, who with all their faults are so kind and ready to help when they have an opportunity, who only need some sympathy, some one who understands them, to show them how to become respected and useful women. They know so little of life, yet many of them think they know so much.

What we should teach our daughters is an inexhaustible subject, with a great responsibility attached, if the parents are willing to acknowledge the importance thereof. I have neither time nor space to discuss the subject fully, or speak of a girl's school work; but there are many other things essential for her to learn (to make life a success), outside of books. My experience is rather limited in this respect, but it is an old saying that "the one knows best how to do a piece of work who has never made the trial." It is a question whether the old adage holds good in this case or not. However, I will give you my views on the subject, and you can agree or disagree with me, whichever suits you.

After all is said and done, a great deal depends on the girl herself. There can be no rule which every parent can follow, as there are so many dispositions to contend with. But every parent should make each daughter an especial study, and strive to understand what is needed by each one. A living example may have a great influence. One thing I have learned from observation as well as experience, that the parents

should possess good judgment, must learn self-control, and practice a great deal of patience, if they expect good results. The old proverb, "Life is a school," makes us all learners, from the beginning of our lives to the end, and our mistakes are many.

I believe one reason there are so many daughters who are not what their parents had planned they should be is because of the mistaken idea that if they provide a home, food and raiment their duty is done. They send their daughters to school and to Sunday school and expect the teachers in those schools to teach all that is taught there, with the home training added thereto. They shirk their own work and expect others to take a great interest in their children, where they seem to have very little. It is no uncommon thing for parents to be so absorbed in the affairs of the world that they have no time to know what their girls are learning, until they awaken to the fact that they know some things which they had better never have learned. Then they will lament and bewail over the "total depravity of the human family," and wonder why their burdens are so great, and assume the "martyr role," with such meekness that it is simply disgusting. It is the parents' duty to watch for their daughters, and shield them from the dangers and temptations attending the journey through life, and if this duty is neglected it is often rewarded with sorrow. The home training must not be neglected. The girl who receives censure for almost everything she does soon becomes hardened to fault finding and cares very little what she does or says, as she is sure to meet with reproof anyway. While the parents should counsel and instruct them so that they may be able to fill creditable positions in life, they should avoid continual and never-ending nagging. No girl's patience can endure an ironclad rule.

Fathers, mothers, let me tell you a secret; your daughter does not enjoy being snubbed any more than you do. The mother is supposed to be her young girl's best friend, sharing alike her joys and sorrows, and while she should oppose wrong in all its different phases and stand firm in favor of right, she should not be too exacting, expecting her daughter, without experience, to always view things in the light the mother does with all her years of experience. The daughter should always be willing to receive advice when given in a proper manner. Sometimes it requires a little tact and forethought if the daughter is very sensitive.

The question what we should teach the girls can be answered better when we know what we wish them to be. If only "fashionable butterflies," knowing nothing and caring for nothing except the fashionable routine of "late hours," "dress," and "small talk," by which they entertain the "foppish dude" who never did anything worthy of mention, we need not take much trouble with them, but allow them to go and come when and where they please. Place no restrictions on them whatever; let them attend school or not, whichever they choose to do; take no account of their associates; turn them loose on the streets day or night, no matter

which, and their education will soon be finished, to the grief and sorrow of all their friends.

I believe the success of this nation depends largely upon the girls of the nineteenth century, for the more refined and cultured the women are the better citizens the men are. And what this country needs more than anything else is good, honest men and sensible women. The home is the school where they are to learn the true principles which last through life and make life worth something. If we desire our daughters to grow up to be true, noble, Christian women, worthy and able to fill any position with credit, we can not be too careful of the instruction they receive. Every girl should learn in childhood that she has a duty in this life to perform and that she should listen to the voice of conscience, and be guided by that sense of right and wrong. I would have her taught everything that would have a tendency to refine and make her a cultured lady. Not one who is ignorant of the work supposed to belong to a woman's sphere (take care of the home), but she should be taught that art in every particular. But one who will work willingly and cheerfully and yet knows something else besides work, and is not bound down as a slave to that work with no higher thought than what we shall eat and wear. Life is too short to give all of our time and attention to the perishable things of this world. A few years ago it was not considered necessary, by a great many people, at least, to educate the girls thoroughly, unless they expected to become teachers. But to-day, thanks to the public school system, any girl can have an education almost without cost, which, if she is energetic and diligent, will enable her to maintain a position among learned people with credit to herself. She can gain much information by being an attentive listener to the conversation of others. Among the many things for her to learn early in life is that although she may be very bright and very intelligent there are others who are just as bright and intellectual as she is. In fact, she must learn to live and let live; and that there is a higher power than her own will by which she will have to be governed. The lesson of submission must be learned by all, and the sooner the child begins to live for something else than self the easier the lesson is to learn. I would strive to impress on every girl's mind that selfishness was a sin, and if she would be amiable and pleasant, must not be selfish. And to be courteous and respectful with all, and especially kind and pleasant to aged people.

Those who are worn and weary with the journey through life will appreciate and remember any little favor shown them by the young people long after they have forgotten the kindness. Young girls often forget they may live to be old. This is quite important. A true lady will treat "the old folks kindly." I would have every girl be a true American and respect people for themselves, not for the position they occupy, and honor honest industry everywhere. Never look with contempt upon one who labors for hire, as if the fact of receiving compensation for work

should degrade any honest man or woman. There is too much homage paid honor and wealth and not enough to true principles. There have been as honest men sat on the shoemaker's bench, or worked at the blacksmith's forge, as ever sat at the desk in the countinghouse; and it is as honorable to be a tiller of the soil as to be a merchant or banker; and just as creditable to cook the food necessary to sustain life as it is to fashion the raiment that is considered so very necessary to bring happiness. It may not be considered so by some people, but I fail to see the difference.

Every girl should learn to do some kind of work, to enable her to support herself were she thrown upon her own resources. She should be thorough in her work and remember that "what is worth doing at all is worth doing well." If a girl has a taste or talent for any particular work, I should cultivate that talent by all means.

I would insist on extreme neatness and yet not be too fastidious. Every girl should learn the use of the needle so that if it ever was necessary for her to support herself by that means she would be prepared for the work. Farmers' daughters are usually so busy through the summer season that there is very little time for much besides the weekly mending, of which there always is an abundance. Yet it is a mistake to not teach the girl how to make new garments as well as repair old ones, and do both neatly. There may not be much glory in sewing on a patch, or a button, but it often affords a great deal of comfort. Do not despise the little things.

For the benefit of the girl, I would teach her to be frugal, learn the lesson of economy well, not miserly, but be independent enough to live within her means, no matter how limited the means are. Every girl should acquaint herself with the financial standing of her family, and govern herself accordingly. Many a man has been driven to dishonesty by the extravagance practiced in his home.

* * * I would have every girl retain her girlhood as long as possible. We have too many young "ladies" at fourteen years of age, and how silly some of them are. Many people seem to think a girl is ready to "enter society" and receive attention from the gentlemen, or, in other words, have a "beau," at that age. If she does, by the time she is twenty, or perhaps a year or two more, she has been in society so long she is snubbed as an "old maid." Some girls would rather marry some worthless fellow, and support herself and her husband by means of the washtub than be called a "spinster." The washtub is all right, but one would be enough to support by that means, and that one myself, if I had the work to do. One reason of so many unhappy marriages is that the young folks get the idea that to create a sensation and get their names in the papers they must get married. They do not wait to know whether they can live together or not, and sometimes they have very little laid by to live on, and can not live agreeable, and then the cry of "marriage is a failure. * * *"

Teach the girls to take care of their health. This is every mother's duty. Allow them plenty of exercise in the pure fresh air and sunlight. The farmers' daughters have ample opportunity for exercise, and as a rule have good health.

One thing more I wish to speak of that I would have the daughter taught, and that is to be charitable in thought as well as in deed with those whom fate or fortune has not dealt kindly with and who are the subjects of everyone's sarcastic remarks. While she should guard her good name as she guards her life and live a life above reproach, there should be some sympathy shown to those whose lives have been blighted by someone whom the world recognizes as honorable, and who often moves in the circle of respectable society. If a woman becomes degraded every woman shuns her as she would shun the "plague." If a man is genteel, refined and polished and possesses wealth, no matter if he is steeped in sin, he can go where he will and find friends.

Farmers, do not be afraid to let your daughters know that you love and appreciate them, for there may come a time when a messenger may come to your home and one of your daughters, in answer to the summons, will go away and never return. Then, regrets will be in vain. Show them now that you prize your crop of daughters more highly than you do your crop of fat cattle. If one should be a little obstinate at times, be patient, let your mind run back some forty or fifty years, and perhaps you can recall a parallel case, where the girl's father figured as a rebellious character, and her grandfather as the restraining power; after due deliberation I think you will decide the girl is only a chip off the old block, and that block is not her mother.

THE FARMER'S DAUGHTER.

MISS MYRTLE CONGER, FLAT ROCK.

[Read before the Shelby County Farmers' Institute.]

Only recently a young lady told me that "her husband was much too smart to be a farmer."

And I heard another city girl say that she had known "some really nice people who lived in the country."

Such expressions are not infrequent among our city brothers, though no doubt they are unconscious of the lack of compliment which they pay us. We have so long lived our independent lives, apart from the townsmen, that perhaps we are largely responsible for their attitude toward us.

Farming is the occupation of occupations. It was the first occupation,

sanctified by a fiat from on high, "Thou shalt till the soil." And whatever the attitude of our city friends toward the farmer, he is largely dependent on the man with the hoe for his success in business. We have helped the city, and the city has helped itself, and that is why it can claim more advantages than we of the country. We have almost become accustomed to this adjustment of affairs, but it should not be so. That we do not have the same advantages is no reason why we can not have them. We are entitled to the same privileges as our dear brother, and it is time that we asked for them and received them.

So much has been said on the subject of rural free delivery that I can add but little more. Do we not need it? Do we not deserve it? Why should not our papers, our letters and our magazines be delivered to us for just the same reasons that they are delivered to our townsmen? Do we not want our morning news? Are we not, as citizens, interested in our country's wars, our country's politics, our country's prosperities and our country's woes, when she has any? Do not our farmers and our stockmen want their business letters promptly, so that they may cope with their competitors just as the men of business in your towns? And is there any reason why they should be less favored?

Do not the farmers' sons and daughters want their magazines and their favorite periodicals at the very earliest opportunity?

And not only should we have our free delivery, but we should like to see street cars stop at our doors. Why not? Our city friends have all these advantages, and more, and are we not entitled to free and equal rights? Yet they do not want us to have them. The farmer must go into your towns frequently; he must sell his grains and other products, and he must buy his farming implements and his merchandise in your towns. He likes to go to his lodges there, and occasionally to political celebrations or national celebrations. Such a railway would most surely be of great benefit to the farmer, and whatever benefits the farmer benefits all people. We should like to go to your churches, to your stores, to your entertainments, and to visit our friends in town whenever we like. Why should not a farmer, or any member of his family, or his entire family if they wish, be able to hail a passing car, and be carried with speed and comfort wherever he wishes to go? Would not the farmer like to send his promising son and daughter to the city high school, or the business college, or perchance to some professor in music or the arts, and yet have him home each night? And the only expense be the railway fare, ten or fifteen cents per day, according to the number of miles. If we had rural traction lines out our way, we could supply enough matinee girls to enable Shelbyville to build a new opera house. And the farmers' wives could support another department store in your town. Our Ohio neighbors have these lines, and they have been both successful and beneficial to the country people and to the towns. No farmer can fail to see the great convenience and good such a manner of transportation would be to him, and he should

do all in his power to bring it about. And the telephones, dear farmers, you have them at last, and you are glad, and you wonder how you ever managed without them. Let these be only the beginning of the many benefits and advantages which you have a right to share equally with your brothers from the city.

Farmers, do you not know that "civilization begins and ends with the plow?" Do you not know that some of the greatest, some of the best, and some of the most prominent men of our country have been farmers? We have had eleven farmer Presidents: Washington, Jefferson, Madison, Monroe, Jackson, Adams, Van Buren, W. H. Harrison, Tyler, Polk and Abraham Lincoln.

I once read an address by the Hon. J. Sterling Morton, in which he said:

"Farmers, love your homes and love yourselves. Love your country better than yourselves. A republic made up of home-builders and home-lovers will always find vast armies ready to defend its laws, its dignity, its constitution and its flag."

Love yourselves, your homes and your children, and love them so well that nothing but the best will satisfy your demands for them and for you.

Just a word for the farmer's daughter. We girls love our homes, and I believe almost every farmer girl does more for her home than an average city girl. She gives more of herself to her parents, more of the labor of her hands to the household, and more thought for the happiness of the family. She does more to make the evening fireside attractive to her brothers, or if she has none, she is willing to share the privilege with the girls who have. But there are many things which we would enjoy that are now denied us by reason of our residence. We would like to have part in your public library, your musicals and your clubs. We love the things that you girls love, and we are not asking more than we give.

And the country boy—many of them have had the advantage of a college education, at least the agricultural college, and there are none better. They are refined and intelligent young men. They have adapted themselves to their chosen occupation with a will and a business-like manner that is both an honor and a credit to themselves. Why should not a young man who owns or at least superintends a hundred or more broad acres, and enjoys the generous if hard-earned income, why shouldn't he wear a dress suit and dance attendance on my lady fair at social gatherings as well as the eight dollar clerk? If any of my city audience, especially if he be a young man, entertains any doubts about the modern farmer girl or boy, I hope he will come down to the country and we will dispel his illusion. The possibilities of the young man and the young women on the farm are great indeed, and if they do not have all the best there is to be had, it will be their own fault hereafter.

And the next time I read a paper at your institute I hope I shall come in on a twenty-minute run in a nice, comfortable traction car, and not a two hours' ride driving a horse that was even more unwilling than I.

HOME SANITATION.

DR. J. L. HENDRICKS, LEBANON.

[Read before the Boone County Farmers' Institute.]

Mr. Chairman, Ladies and Gentlemen—I have not the vanity to believe that your presence in such numbers at this hour is a personal compliment to me, but that your presence is evidence of the deep seated interest you feel in learning through an interchange of ideas the easiest and best methods by which you can attain the best results along all the lines of agriculture. When your honorable chairman and secretary asked me to fill this hour, without much reflection I consented to do so. The task seemed an easy one; but upon more mature reflection I entered upon the work with some misgiving, and to-day I am in doubt as to whether or not I shall be able to advance a single idea upon this subject with which you are not already familiar.

Now, my friends, while I would not at this time indulge in fulsome praise, yet it is within the pale of the truth when it is said the up-to-date farmer reads and thinks for himself, and only up-to-date farmers and their families take an interest and attend such meetings as we have assembled here to-day. This fact admonishes me that I must be very careful of speech lest I get into deep water and drown. The only safe rule to follow in this discussion, as in all others when talking to intelligent men and women, is to hew to the line and let the chips fall where they may. However, I hope with your attention to be able to say something of interest and value to you all.

It is our purpose to steer clear of technicalities, polished rhetoric, flights of oratory, high-sounding and meaningless phrases, and talk to you as your neighbor and friend in language that is easily understood. I understand it that we are here for plain, practical talks that will be a benefit to all.

The subject which we have in hand for the next hour especially merits just such treatment. No subject which has been or will be discussed before this body can be more far-reaching or of deeper significance from every human standpoint, as it affects every phase of human life—its usefulness and happiness. Then how necessary that we as people should familiarize ourselves with the best and easiest means of reaching the best possible sanitary conditions, the full enjoyment of which means the highest type of intelligence, health, morals and good citizenship, the sum total of all that inures to the betterment of the condition of mankind. Sanitation means cleanliness. If we can't keep real clean we should

keep as clean as we can. Cleanliness is next to godliness. Clean surroundings and a clean body insure a happy home and a healthy body, and a mind and heart that is pure—an ideal home, the one in which we hope for all that is pure and happy and makes life worth living.

Up from sanitary homes must come such citizenship as will perpetuate the institutions under which we now live. The instances are few and far between where useful men and women have sprung up from homes wreaking in wickedness and filth. Now, my friends, do not misinterpret what I say. I do not mean the homes of the poor or common people. I remember with pleasure what the sainted Lincoln said concerning the common people. He said, "God loved them best because he made more of them to love." Among the list of men and women who have carved their names high on the pinnacle of fame—lawyers, doctors, divines, statesmen, poets, philosophers, farmers, merchants, inventors, and all else, have come up from humble homes. I give thanks to Almighty God that I was born and live in a country where blood and birthright are not passports to positions of honor and usefulness, but the way is open to all who wish to enter the race. Let a genius break forth on the world and he will be recognized and measured to his full value. No one will ask from whence he came. As the natural trend of man is to seek a wife, build a home or habitation and rear a family, it is difficult to estimate the importance of rearing families in sanitary homes.

Whoever stops to carefully consider the records of the medieval epidemics and seeks to interpret them by our present knowledge of the causes of diseases, will surely become convinced that one great reason why the epidemics were so frequent and so fatal was the compression of the population in faulty habitations, ill-contrived and closely-packed houses, with narrow streets, often made winding for the purpose of defense; a very poor supply of water and therefore a universal uncleanness; a want of all appliances for the removal of all waste matter; a population of rude, careless and gross habits, living often on innutritious food and frequently exposed to famine from imperfect tillage—a condition that exists to-day in some of our newly acquired possessions, of which I shall speak later on. Such were the conditions which almost throughout the whole of Europe enabled diseases to attain a range and display of virulence of which we have now under our sanitary rules scarcely a conception. The more these matters are examined the more we shall become convinced that we must not look to grand cosmical conditions, not to earthquakes, comets or mysterious waves of an unseen poisonous air as the ancients did, but to simple, familiar and household conditions, to explain the spread and fatality of the medieval plagues.

The diseases arising from faulty habitations are in a great measure, perhaps entirely, the diseases of impure air. The site may be at fault and from a moist and malarious soil excess of water and organic emanations may pass into the house, or ventilation may be imperfect and the

exhalations of a crowded population may accumulate and putrify; or the excretions may be allowed to remain in or near the house; or a general uncleanness from want of water may cause a persistent contamination of the air, and on the contrary the following five conditions will insure healthy habitations:

First. A site dry and not malarious and an aspect which gives light and cheerfulness.

Second. A system of ventilation which carries off all respiratory impurities.

Third. A system of immediate and perfect removal which shall render it impossible that the air shall be contaminated from offal.

Fourth. A pure supply and proper removal of water by means of which perfect cleanliness of all parts of the house can be insured.

Fifth. A condition of house construction which shall insure perfect dryness of the foundation, walls and roof. In other words, perfect purity of the air and cleanliness are the objects to be attained. This is the fundamental and paramount condition of healthy habitations, and must override all other conditions. After it has been attained the architect must engraft on it the other conditions of comfort, convenience and beauty. Up to a certain point there is no difficulty in insuring that a small house shall be as healthy as a large one. The site and foundations can be made as dry; the drains as well arranged, the walls and roof as good as a house of much larger proportions. In one respect the houses of the poor are often superior to those of the rich, for the sewers do not open directly into the houses and sewer gas is not breathed during the night. But the difficulty in the houses of the poor is the overcrowding and the impregnation of the walls with foul effluvia and deposits. Consideration of costs will always prevent our poor class of houses from having sufficient floor and cubic space. These two special difficulties must be met by improved means of warming and ventilation, and covering the interior walls with a cement which is nonabsorbent and which can be washed. Perhaps also improvements in using concrete or other plans will eventually so lessen the cost of building that larger rooms can be given for the same rental, and the occupants be taught to prize the boon of an abundant allowance of air, not seek to lessen it by crowding and underletting.

My friends, I would have you constantly keep in mind the fact that we in the rural districts are no less interested in the health of our cities than they in ours. Our interests are mutual. We will now proceed briefly to construct a sanitary habitation.

The foundation walls should be of stone or brick. Stone is preferable as it contains less moisture than brick. Dryness of the foundation and walls of a house is secured by draining the subsoil from four to nine feet below the foundation and in very wet clay soil by paving or cementing under the entire house. The walls are kept dry by being imbedded in the cement, which is brought up to the ground level, by the insertion in the

walls themselves of a waterproof course of slate or asphalt, or, what is better, of ventilating vitrified thin bricks. This, however, is only needed for basements or cellar walls. On wet, damp soil, where a house has no cellar, the flooring ought to be two to three feet above ground. Ample grates should be placed in the walls for perfect ventilation. The yard should be filled with a gradual slope in each direction so as to insure good drainage. The fill should not be nearer than one foot from top of foundation, wall-sill or lower siding. Each outer and inner door leading from one room to another should have over it a movable transom. Movable windows, sufficient to give light and cheerfulness to every apartment. One or more rooms in every house should have an open fire place or grate, always ready for use on cool mornings and evenings and to furnish heat for sick, aged or young persons. Mantels both useful and ornamental are made so cheaply now, for such convenience, that it is careless and criminal to be without them. No habitation should be without a bathtub, and those who can afford a wind pump can erect a tank which can be attached to a heater where heat is constant so as to have cold and hot water always at hand. It is both a luxury and a necessity, its sanitary value can not be computed. These appliances can be had so cheaply that nothing but carelessness will excuse the owner of any building from obtaining them. Dryness of the roof should be carefully looked to in every case, as water often gets to the walls through a sad roof and the whole house becomes damp and dangerous to health. The condition of the basements or cellars if they exist requires as much or more attention than any other part of the building, as the air of the house is often drawn directly from them. They should be dry and thoroughly well ventilated, and the house pipes, if they run down to the basement, should always be uncovered so as to be easily inspected and any bad fitting joint or crack or imperfect tap, if there be one inside the house, be at once remedied.

I can not speak of cellars only to condemn them, as most of them are receptacles for all kinds of rubbish, boxes, barrels, decaying vegetables of all kinds, tainted meats, rancid lard, bones and soap grease, with worms and bugs holding high carnival. In short, they usually contain offal of every description, teeming with bacteria and death-dealing microbes, penetrating every apartment about the building. A constant menace to the health and life of the occupants.

A better plan is to construct a warm house on top of the ground adjoining the house. It is cheaper, more convenient and safer from a sanitary standpoint. It is easier of ingress and egress than a cellar. Lessens labor of removing decaying vegetables and all other obnoxious matter.

Every dwelling should be surrounded by a tight fence, according to taste and ability to construct, so that stock be not allowed to roam at leisure near the dwelling. Nor should fowls be allowed the freedom of the yard or allowed to roost in the trees or near the dwelling. The hennery is the place for fowls and the barnyard the place for stock. Barns,

pig sties and all outbuildings should be as far from dwellings as convenience will allow, and always under the best sanitary conditions possible. But I fancy I hear some one saying that what you have said sounds nice and would no doubt be beautiful to look upon and a very desirable place to live, but it is impossible to attain that high degree of beauty, cleanliness, comfort and convenience which you have pictured. Pause a moment and think, "Have we been indulging in vagaries or advancing ideas impractical or suggesting things impossible?" We believe that we have been within the bounds of reason, and with the time, energy, muscle and money spent foolishly applied to the improvement of our places of abode, the surroundings of many of us would be a little more inviting, to say the least. My friends, did it ever occur to you that if the money spent annually for intoxicants and for tobacco to chew and spit out, cigars and cigarettes which go up in smoke, turned into legitimate channels would build a home for every homeless family and furnish them with comfortable clothing to wear and wholesome food in abundance to eat? Last but not least, and best of all, our jails and penitentiaries would have fewer inmates, poverty and want would almost be banished from the land and in its wake would come a higher type of physical, moral and mental citizenship, and the germs of disease, pestilence and death, which are born in the slums and wafted by the wind, would blow away forever.

The warming of habitations will be the next to engage our attention. This must be left largely to the judgment of each individual, and allowing him to select his own method. The heat of the human body can be preserved in two ways. First, the heat generated in the body, which is continually radiating and being carried away by moving air, can be retained and economized by clothes. If the food be sufficient and the skin can be kept warm, there is no doubt that the body can develop and retain its vigor with little external warmth. In fact, provided the degree of external cold be not great, when, however, it may act in part rendering the procuring of food difficult and precarious. It seems that cold does not imply deficiency of bodily health, for some of the most vigorous races inhabit the cold country. Second, external heat can be applied to the body, either by the heat of the sun, the great fountain of all physical force and the vivifier of life, or by artificial means. And in all cold countries artificial warming of habitations is used. The point to determine in respect to habitations are, first, what degree of artificial warmth should be given; second, what are the different kinds of warmth and how are they given? These need not nor can not be discussed here. Time and space forbid.

I will now pass on to the most important question of all, that of water. It is impossible to overestimate the sanitary importance of water for the welfare and comfort of man. For the preservation of a proper degree of cleanliness of our persons, our clothes, our dwellings or the articles with which we have to come in contact it is indispensable. As

regards our food, it must be remarked that about 75 per cent. of the human body consists of water, and the food to nourish one should contain about 81.5 per cent. of water. What is termed solid food contains, roughly speaking, from 50 to 80 per cent. of water, and thus, to make up the necessary amount of water, some must be drunk as water or in some beverage of which water is the chief constituent. A healthy man weighing 150 pounds requires every twenty-four hours about five and one-half pints of water in some form or other. When the amount of water in the system is diminished about one per cent. of the whole, the sensation of thirst is felt, which we usually allay by imbibing the needful amount. In brief, water is a prime necessity for human beings, both externally, for cleanliness, and internally as food.

The water which we require in our daily life and avocations comes to us more or less directly from the clouds as rain or snow. The water may be collected directly as it falls or it may soak into the earth and flow forth again as springs, forming eventually ponds, streams or rivers. Or it may penetrate deeper and require us to dig wells in which it may collect. Our sources of supply may therefore be classified as rain water and surface water, including springs, ponds, streams, rivers and well waters. From none of these sources, however, can we obtain water which is chemically pure. That is, nothing other than the compound oxygen and hydrogen known under that name because water is a great solvent in nature and dissolves some of every substance, gaseous or solid, with which it comes in contact. Many of these substances are beneficial, most of them are harmless, while some of them are not only hurtful but may even be deadly. I can not discuss the kinds of impurities, using the term "impurity" in its widest sense. Suffice it to say, the different kinds of impurity which may be met with in water are gaseous, mineral and organic, vegetable and animal. The mineral and organic impurities may be dissolved in the water or partly dissolved, or partly suspended (still in solid form). The particles suspended may be in so finely divided a condition as to elude the eye, and the water appear clear and bright. Water containing some of the most dangerous forms of decomposing animal matter may often be pleasant to the taste; hence, it is plain that the palate can not be depended upon in judging of the safety of a drinking water. It should be free from odor even when warmed and suspended matters should not be present.

Waters from driven and deep wells are the safest and cheapest. Shallow well water is always to be viewed with suspicion. It is the natural point to which the drainage of a good deal of surrounding land tends, and heavy rains will often wash many substances into it. And there can be no longer any doubt that shallow and dug wells are a constant menace to the health of whole communities. From contaminated waters holding in solution many poisons and containing the germs of typhoid and typhus fevers, dysentery, cholera and many other grave

diseases. It is not an uncommon thing to find dug wells with defective curb and platforms to contain, besides the water, rabbits, rats, mice, frogs, snakes, and occasionally a cat or two for good measure. A whole menagerie is sometimes found in the bottom of a well. A family receiving their water supply from such a source has the advantage of mixed drinks to say the least. And the doctor's gig will often be seen at the front gate. Where such conditions prevail let us for a few moments inquire what sanitation is and what it does for mankind. The art of sanitation or hygiene is the art of procuring health, that is, of obtaining the most perfect action of body and mind during as long a period as is consistent with the laws of life. In other words, it aims at rendering growth more perfect, decay less rapid, life more vigorous, death more remote. The practice of hygiene remained in the same limits for centuries until physiology, the knowledge of the laws of life, began to be studied. We have now commenced to apply the discoveries of physiology to the improvement of health and to test the value of its own rules by this new light. It is now becoming an art based on the science of physiology with whose progress its future is identified. If we had a perfect knowledge of the laws of life and could practically apply the knowledge in a perfect system of sanitary rules, disease would be impossible. As it is to-day, seventy-five out of every hundred funeral processions which pass by, the hearse contains a victim of nature's broken law and persistent disregard of sanitary rules. If we cared for these bodies of ours, as God intended we should, millions of men and women who now die young would pass the century point in life. But at present, disease exists in a thousand forms and the human race languishes and at times almost perishes under the grievous yoke. Taking the words sanitation and hygiene in the largest sense, it signifies rules for perfect cleanliness, culture of mind and body.

It is impossible to dissociate the two. The body of man is affected by every mental and moral action. The mind is profoundly influenced by bodily conditions. For a perfect system of sanitation and hygiene we must care for and train the body, the intellect and moral faculties in a perfect and balanced order. I ask, "Is such a system possible, is there, or will there ever be such an art, or is the belief that there will be one of those dreams which breathes a blind hope into us; a hope born only of our longings and is destined to die of our experience?" And indeed when we look around us and consider the conditions of the world, the abundance of life, and its appalling waste, allow me to rivet this thought in your mind: I not only wish to drive the nail home, but clinch it. Turn your eyes toward South Africa and drop a tear for the embattled farmers of that country, whose lives are going out by hundreds in defense of their homes and independence against the tyranny and piracy of Great Britain, the gigantic old thief of the age, in her greed for diamonds and gold, who is sacrificing thousands of young lives. Who can estimate the value of only

one human life? Go into our woodlands and fields and listen to the mournful note of the lone bird calling for its mate which has been sacrificed to satisfy the votaries of fashion. Why this wanton waste of life? Follow me into our slaughterhouses and witness the cruel and barbarous method of taking life. Your blood would curdle at the cruelty and if you are a thoughtful man you must conclude that such scenes must of necessity blunt the finer feelings and brutalize those who daily witness such scenes and leave its imprint upon posterity. We call for the humanitarian to get to his work and stay until the taking of animal life for man's sustenance shall be reduced to the minimum, quick and painless, and our Christian civilization take rank where it belongs. Witness the wonderful contrivances, the apparent indifference with which they are trampled under foot. Look at the gifts of mind, its perversion and alienations and when especially we note the conditions of the human race and consider what it apparently might be and what it is, its marvelous endowments and lofty powers, its terrible sufferings and abasement, its capacity for happiness and its cup of sorrow, the boon of glowing health and the thousand diseases and painful deaths, one must indeed be gifted with sublime endurance or undying faith who can still believe that out of this chaos order can come, or out of this suffering, happiness and health. Whether this world is ever to see such a consummation, no man can say. But as ages roll on hope does in some measure grow.

In the midst of all our weaknesses and all our many errors, we are certainly gaining knowledge, and that knowledge tells us in no doubtful terms that the fate of man is in his own hands. It is undoubtedly true that we can even now literally choose between health or disease. Not perhaps individually, for the sins of our fathers may be visited upon us, or the customs of our life and the chains of our civilization and social custom may gall us, or even our fellow men may deny us health or the knowledge which leads to health. But as a race, man holds his own destiny and can choose between good and evil and as time unrolls the scheme of the world it is not too much to hope that the choice will be for good.

My fellow countrymen, I feel there was never a time in the history of this nation when its interests as a whole people demanded the enforcement of the best and most rigid sanitary rules. This is not the time or place to discuss the why. Using the language of another, "It is not a theory that confronts us at home and abroad, but a condition." As a nation, we have extended our possessions to the westward and made the Hawaiian Islands, the home of the leper, a part of us. Still farther away and we have garnered in the Philippine Islands, which contain the soil needed for the seeds of the plague to fall and grow until death lurks in every flower and rides on every passing breeze. Off the coast of our own south land, we have folded our loving arms around the island of Cuba,

the hotbed of yellow fever, more dangerous and deadly than Spanish bullets. Who can foretell the results if not stayed in their onward march? Many fresh mounds will be reared in the graveyards, and many hearthstones desolated. We can and must prepare for and meet these conditions with intelligence and patience, and patriotism, measuring up to the best of our sanitary knowledge, so that future generations may take up the work well done where it falls from our hands and enjoy the blessings, if blessings come, or suffer, if suffer they must.

To whom must we look for advice and guidance in this all important work? Our only hope lies in the combined effort of a great army of physicians in this country, who regardless of isms or path are to-day as they ever have been, in the forefront, to discover and urge the enforcement of the best sanitary measures. They are standing to-day as a solid phalanx in the battle for the people and against disease, pestilence and death, making greater sacrifices than any other class of men on earth. Self-interest, time, money, and even life is often laid upon the altar as a sacrifice, often forcing the people by law to stamp out epidemics which if left alone would fill his purse with gold. Who ever heard of a banker or money lender offering money at a lower rate of interest than the demand in the interest of the public? Not one. Do you know a merchant that sells goods so as to make less money for the good of the public? Find me the manufacturer who lowers the price of his products in the interest of the people. Show me the farmer who is willing to sell hogs, cattle and corn, the fruits of his labor, at a sacrifice in the interest of public health. Not one. While the doctors of this country never falter in this work impelled only by a sense of duty, not so much as receiving a word of encouragement or an approving smile from our exacting people. He may feel that he is not appreciated now, but as the years go by, future generations who reap the fruit of his labor will rise up and call him blessed. Then and not until then will he receive his just recognition and take his place where he belongs as an angel of mercy to mankind.

And now, my friends, I have finished my task. I have not sought to say many new things. I have sought to give you such plain and practical hints as I thought would be of value. I have left much ground untouched, fearing I would say more than you would care to hear. In reviewing what I have said I can not believe that I have made any impression that is bad, even if I have done no good. The generation who is acting with me on the stage of life will soon be gone and the young men and women of to-day will be occupying our places. We pray you may come a generation enlightened, strong and noble and expansive in all your views and feelings. Strong and mighty are the men and women who are to be swimmers with you in the stream of life, high the waves which you are to buffet, swift the currents which are to set against you, and fearful the results. What results will the coming generation of men witness, what question will

they settle, what a multitude are to be eternally affected by their character? If at last it may be found that I have encouraged one, strengthened one or helped one to meet the responsibilities of life, I shall be thankful that I had the opportunity to thus address the most important class of my fellow men now on the face of the earth.

TRUSTS.

G. L. FURNESS, FURNESSVILLE.

[Read before the Porter County Farmers' Institute.]

It is hardly necessary to offer an excuse for presenting the subject of trusts before this assemblage of farmers. While it may not be considered essentially a farm topic, it is a matter with which we are vitally concerned and one that calls for our best study and thought. Monopolistic corporations or trusts as generally known, while of comparatively recent origin, have been rapidly assuming such vast proportions, spreading so universally and apparently menacing public welfare to such an extent as to cause general alarm. If this paper serves to encourage us in the least to give the question more thoughtful attention, its mission will have been fulfilled.

It is certainly a condition that can not be remedied by thoughtless denunciation and wholesale condemnation. The Federal government as well as some thirty or more of the States, through their law making bodies, have attempted to curb the ravages and remove the fangs from this new commercial or industrial monopoly by legislative enactment, so far apparently without the desired result. Texas and Arkansas notably have recently passed some very stringent laws which seem to operate more directly to the detriment of their own people than to the injury of the trusts which they seek to destroy. One of the provisions of the Texas law is that any corporation seeking to monopolize the markets or fix arbitrary prices on their product can not recover pay through the courts for goods sold in the State, consequently trusts organized in other States simply say to the Texas citizen: "If you want our goods and you can't very well get along without them, neither can you get them elsewhere, just hand over your cash in advance and we will ship you the goods later on, besides charging you a little extra premium for interfering with our method of doing business."

The courts have in the past month declared the Illinois law unconstitutional because it attempted to relieve farm products in the hands of

the producer from restrictions placed upon other products, thereby violating the constitution, which says there shall be no special or class legislation. The Indiana law contains a similar clause, and is liable to the same construction.

The civic federation, of Chicago, a non-political body whose praiseworthy object is to enhance the general welfare of all the people, felt that the subject was of sufficient importance to call a meeting last September, to which was invited men of all shades of belief, from Maine to Texas, and representing all conditions of life—employer and laborer, college professor and farmer, socialist and anarchist. After four days of oratory and eloquence, of speeches indicating careful study and much thought, depicting the causes and effects, the benefits and dangers and suggesting remedies or the let them alone and they will cure themselves policy, from the various standpoints of the different speakers, the meeting finally adjourned without reaching any definite conclusions or without making any recommendations.

It may be of interest to go back a few generations and follow up the growth of this octopus, this hydra-headed monster, this strangler of competition, this gormand who feeds upon human human life blood, as it is so wont be characterized by demagogues and those seeking self-elevation by influencing the minds of the people against real or imaginary evils, without showing them how to free themselves. In the early history of farming nearly all the operations of life were carried on by each individual household and methods were necessarily slow and cumbersome. It soon developed that few men are capable of doing many things and doing each of them well. He who could make shoes well or he who was better adapted to watch making found it more satisfactory and also more profitable to follow exclusively the one line of work, and we find the itinerant cobbler or clock maker going from house to house, following each his particular calling, becoming always more expert, able to do more and better work, and under the stress of rivalry and competition to lower his prices. In order to save time and economize labor he builds a shop where work is brought to him, and his former rival, seeing the advantage to be gained, becomes his partner. This combination or co-operation of energy and capital gives the stronger or more successful manufacturer a decided advantage over his other and less fortunate rivals, and by the use of machinery which the combination is able to introduce as conditions change, the former rival is crowded out of business and compelled to leave his little workshop, where he did all the work on a pair of shoes from the leather to the completed article, and becomes a piece-worker in the factory of his competitor, where he not only works less hours but is paid better than before. Other shops and other capital, not slow in realizing the advantages of combination, have also incorporated, and each new establishment becomes the rival or competitor of all the others and a fierce warfare springs up between

them, each sending out numerous salesmen or commercial travelers and each paying money in railroad fares, hotel bills and advertising matter, each covering the same territory in his endeavor to secure the same trade. Often in his zeal and determination to get control of the markets, prices are cut below the actual cost of production, and disaster follows until some patched up agreement can be reached to pull together and maintain prices, thus practically illustrating the value of co-operation to those directly concerned in it. From this condition it is a short and rather natural step to the last and present phase of the industrial situation that now confronts us—the consolidating of all the interests of one line of business into one corporation, or, as we have learned to call it, a trust. Even the workmen, following out the same idea, have combined themselves, for their own mutual protection, into unions, and may practically be called trusts when they seek to dictate terms and wages.

Now if this combination were satisfied to produce as cheaply as it might under these conditions, pay a reasonable dividend upon the actual capital employed, pay good living wages to all its employes and give the balance of the benefits to the customer, who could possibly find any fault with a trust or any other combination or corporation.

Self-interest, however, is one of the dominating characteristics of mankind, and is bound to develop itself wherever humanity exists. We find, therefore, immediately that when a corporation, or an individual, for that matter, can control or monopolize any article of commerce, the tendency is for prices to advance on that article without regard to the laws of supply and demand, but simply to benefit the producer at the expense of the consumer. The stronger and more firmly intrenched the organization becomes, the more rapacious it seems to grow, and woe be unto him who by honest competition has the temerity to seek a livelihood independently. His business downfall is swift and certain, caused by methods too well known to recite.

It would be absolutely impossible in this day and generation to carry on our commerce without the aid of corporations. Our vast territory has been opened up to civilization, made habitable and productive, placed in easy communication throughout its extent, and made happy homes possible by their aid. The value of corporation can be exemplified in many ways. Take, for instance, the present German empire, one of the recognized first-class powers in whose unity lies its security and strength. It never could have attained its present condition had not the imperial Bismarck, with his broad-gauge mind and iron will, recognizing the value of co-operation and union, consolidated all the small and petty states and warring factions into one great and glorious empire.

Look on the other hand and see the great loss and waste of energy by lack of co-operation as illustrated by our present method of handling the milk business. Each large city and town is supplied by numerous

dealers, each one with his customers, and each spending the larger part of the day leaving a pint here and a quart there, crossing and recrossing each other's routes, requiring three men and teams to do what one could do in less time, and under the fierce competition it may not be strange that he is sometimes open to the accusation of watering his milk as well as his cows.

What a saving might result under a systematic distribution, or if you will, under a trust that could dispense with much unproductive labor and which would not only increase the producer's profits, but at the same time lessen the cost to the consumer and improve the quality of the milk as well.

It is true that some men would be thrown out of their present employment, but that has been the history of all economic changes. The old stage driver was forced out of business by the locomotive. The farmer boy of to-day is a stranger to the scythe, the grain cradle and to the old flail. Yet he has no occasion for idleness. We would not return to these conditions if we could, nor could we if we would. There is work enough for all to do without danger of overproduction, when the time arrives that each individual toiler is able to use for his own needs the wealth produced by his own effort. This question is above and beyond party politics.

Trusts are not creatures of party policy, but of human greed. The president of the sugar trust, as is well known, testifying before the senatorial investigating committee a few years ago, said: "We contribute to the Democratic campaign fund in the Democratic States, and to the Republican fund in Republican States."

It is evident that trusts care nothing for party lines, but simply seek to perpetuate and intrench themselves more firmly.

The agricultural interests of our country, the great foundation industry, that makes it possible for other industries to prosper, that furnishes 70 per cent. of the wealth of the country and 60 per cent. of the freight carried on all our railroad, river, lake and coast trade, are most seriously and injuriously affected by these conditions and practices. The farmer is admittedly the great conservative element in our government. He lives isolated, his mind is largely devoted to the production of more bushels of grain, more tons of hay, more pounds of beef and pork, every bushel or pound of which comes in direct competition with that produced by his neighbor. He also occasionally holds a farmers' institute, striving thereat to teach his neighbor better methods whereby he can become a still more active competitor of himself. From the very circumstances of his surrounding conditions, from the fact that his products are produced in small quantities, over the whole extent of out doors, no trust conditions are possible for the farmers, should they be desirable.

Not until the results of his toil are gathered together by means of syndicate railroads paying dividends upon watered stock and piled up in immense storage houses owned by aggregated capital, can they be manip-

ulated and made to produce a handsome revenue to speculators and middlemen, who have never created one dollar's worth of wealth. The granger government, so called in 1870-71, was the result of oppressive methods and charges levied upon western farmers by railroads and warehousemen. The success of the movement in calling a halt and remedying some of the evils complained of, is an indication of the latest strength of our farm population, when once aroused to concerted action. Farmers are docile, they are slow to action, they will bear much imposition, but they have never been accused of cowardice. When greed and avarice have caused the burden to become too severe, and by the very weight of their oppression compressed them into one compact organization, then will they rise in the majestic strength of an outraged people and overthrow their oppressors, even as our forefathers overthrow the oppression of a tyrannical government and evolved this glorious republic of liberty-loving people.

INDEX.

A

AGRICULTURAL EXPERIMENT STATION—

	PAGE
Board of Control	740
Officers and Staff	740
Report of Directors	741
Pamphlet Bulletins	743
Newspaper Bulletins	743
Station Mailing List	745
"Rose Growing, with Chemical Fertilizers," Wm. Stewart	745
Selection of Plants	747
Soil	747
Pots	747
Fertilizer	748
Grouping of Fertilizers	751
Wintering Plants	755
Pruning	756
Product of the Plants	760
Summary	773
Insects	773
Insecticides	774
"The Mammary Gland," A. W. Bitting	774
"Pseudo Scabies," A. W. Bitting	783
"Effects of Eating Mouldy Corn," A. W. Bitting	783
"Continued Effects of Fertilizing the Soil," W. C. Latta	787
"List of Corn Cultural Implements," W. C. Latta	792
Albion Spring Tooth Cultivator	793
Corn Plow	793
Hoosier Cultivator	793
Tower Cultivator	793
Breed's Weeder and Harrow	793
Hoke Cultivator	793
Rock Island Disk Cultivator	793
"Field Tests of Varieties of Wheat, Covering Nineteen Years," W. C. Latta	795
"Foreign Crops," W. B. Anderson	800
Experiments at Station	800
Breaking and Cultivating	801
Corn	801
Kafir Corn	801

AGRICULTURAL EXPERIMENT STATION—Continued.

"Forage Crops"—Continued.		PAGE
Sweet Sorghum		801
Dwarf Essex Rape		802
Leguminous Plants		802
Soy Beans		803
Cow Peas		803
Field Peas—New Varieties		804
Miscellaneous Crop		804
Vetches		805
Co-operative Experiments		805
C. B. Benjamin, Lake County		805
Cal. Husselman, Dela'b County		806
J. W. Billingsley, Marion County		806
D. B. Johnson, Morgan County		806
N. D. Gaddy, Jennings County		806
T. E. Ellison, Allen County		807
Dr H. S. Wolfe, Floyd County		807
Analysis of Feeding Stuffs		807
Large Green Okra Seed		807
Rauh's Stock Food		809
Distillery Slop		810
Material for Packing Horses' Hoofs		813
Composition of Bones in Sound Horses and Those Suffering with Osteo- perosis		813
Analysis of Maple Sugar		815
Tests for Strength of Solutions of Formaldehyde		816
Reducing Power of Taka-Diastase		818
Russian Apples in Indiana		818
Experiments in Forcing Vegetables		824
Corn Smut		826
List of Trees and Shrubs in Purdue University Grounds		878
Experiment Station Piggery		882
Gifts to Experiment Station		887
Treasurer's Report		892
Financial Statement		893
The Sugar Beet of Indiana		895
Skim Milk as Food for Young Chickens		914
Field Experiments with Corn		920
Mangel Wurzels—Cost of Production		926
Formalin for Grain and Potatoes		929
San Jose and Other Scale Insects and Indiana Nursery Inspection Law .		935
Roots as Food for Pigs		943
Sheep Shab		953
Field Tests with Fertilizers on Heavy Clay Lands		964
Agriculture—U. S. Department of		729

	PAGE
Anderson, W. B., "Forage Crops"	800
Arbuckle, L., "Benefits Derived from Breeders' Meetings"	308
Ayres, W. A., "Where and How to Select Breeding Animals"	282
Ayres, W. A., "Do Public Sales Benefit the Breeder?"	322

B

Barker, I. N., "Preparing Hogs for Show Ring"	304
Bitting, A. W., "Diseases of the Pig"	214
Benjamin, C. B., "Dairy vs. Beef"	475
Billingsley, J. W., "Business Side of Dairying"	516
Bitting, A. W., "The Mammary Gland"	774
Bitting, A. W., "Pseudo Scabies"	783
Bitting, A. W., "Effects of Eating Mouldy Corn"	783
Bone, J. H., "Fattening Hogs for the Market"	316
Bowles, T. E., "Results of a Flock of Forty Ewes"	414
Brewer, F. W., "Pneumonitis"	703
Brown, J. P., "Park and City Trees"	630
Brown, J. P., "Good Trees for School Grounds"	646
Brown, L. Newt., Address	673
Burton, Joe A., Vice-President's Report, Second District	594
Burton, Joe A., Report of Superintendent of Experiment Orchard	597
Bueick, Mrs. Kate M., "Evolution and Development of Dairy Cow"	540
Butler, Amos W., "Value of Horticulture to Public Institutions"	634

C

Churchill, H. Z., "Best Summer Pasture for Hogs."	352
Clark, Sam, "Young or Old Sows for Breeders"	376
Collins, E. H., "Why Do Hogs Get Sick?"	296
Crumrine, Monroe, "The Hog and Its Management"	3 2
Collins, E. H., "Some Mistakes in Corn Growing"	694
Conner, J. B., "Indiana and Its Progress"	153
Cowdry, I. N., "Streaks of Lean"	357

D

Do'ge, J. R., "American Swine"	374
Downing, Chas., "Neglected Things by Managers of Fairs"	51

F

FARMERS' INSTITUTES—

Report of Superintendent	977
Complete List of	979
Table of Attendance	982
Expenditures	984
Program	985
Counties Represented	987
Resolutions Passed	991
The Work and Its Needs	992

FARMERS' INSTITUTES—Continued.

	PAGE
"Cattle for the Farm"	994
"Poultry Raising"	997
"Value of Sorghum as a Forage Crop"	999
"An Ideal Farmer's Garden"	1002
"Care of Cream and Churning"	1005
"The Hessian Fly"	1009
"How to Avoid Competition"	1011
"Business Methods of Farming"	1012
"What a Woman Can Do on a Farm"	1014
"Farm Accounts"	1016
"Purchase and Care of Farm Tools"	1018
The Farmer's Workshop	1022
What the Farmer Should Know and Do	1023
The Educated Farmer	1025
Winning Success on the Farm	1029
Why Should Not Farmers Have Seats at First Table?	1031
What the Basis of Equitable Land Rent?	1035
Farming by Observation	1038
Views of Farming From Tenant's Standpoint	1043
A Few Birds and Their Relation to Agriculture	1045
Unappreciated Advantages of Farm Life	1051
Organization	1052
Good Roads	1056
Our Homes	1060
Hereford Cattle	1061
Mothers on the Farm	1062
The Secret of a Happy Home Life	1064
Our Boys and Girls	1066
The Unexpected Guest	1069
Our Daughters—What Shall We Teach Them?	1071
The Farmer's Daughter	1075
Home Sanitation	1078
Trusts	1087

FERTILIZERS—

For the Corn Crop	695
Rose Growing, with Chemicals	745
Continued Effects on Soil	787
Field Tests with, on Clay Lands	964
Flick, W. B., "Is Carolina Poplar Desirable for Street Planting?"	622

G

Garten, John G., "Shaping Stock for Show Ring"	305
Green, D. J., "How to Care for Brood Sows"	338
Greiner, L. A., "Fistula"	706
Grosman, J. C., "Local Horticultural Society Program"	618

H

	PAGE
Hart, W. A., "Good Principles Observed in Feeding"	287
Hart, W. A., "Convenience in Handling Hogs"	358
Haley, W. S., "Thumps in Pigs"	366
Hibbs, J. O., "Value of Pure Bred Hogs for Market"	371
Hobbs, C. M., President's Address	585
Hog Cholera Cures	336
Hull, Anna M., "Cheese Making on the Farm"	573
Hunt, T. F., "Place of Corn Fodder in the Feeding Rations"	492

I**ILLUSTRATIONS—**

Physical Map of Indiana	156
Map of Indiana, 1817	157
State House at Corydon, 1816	159
Constitutional Elm at Corydon	161
Primitive Wooden Plow	170
Cast Iron Plow, Patented 1797	171
Adjustable Point Plow, 1819	172
Primitive Brush Harrow	173
Patent Rotary Harrow, 1859	175
Pioneer Hand Planter	176
Wheelbarrow Planter, 1825	177
Primitive Cultivator	178
Straddle Row Cultivator, 1835	179
The Colonial Reaper	180
Grain Cradle Reaper	182
Reaper of 1835	183
Pioneer Hand Flail	184
Grain Threshing Floor	185
Kingan's 200 Ton Ice Machine	379
" Ice Making	381
" Loading Ice	383
" Hog Handling	385
" Rendering Tank	386
" Filling Lard Tanks	387
" Lard Oil Presses	388
" Salting Meat	389
" Beef Cooling Room	390
" Preparing Tongues	391
" Making Cans	392
" Labeling Room	393
" Butterine Cooler	394
" Sausage Meat Cutter	395
" Casing Cleaning Department	396
" Jobbing House Yard	397

ILLUSTRATIONS—Continued.

	PAGE
Portraits of Officers State Dairy Association	463
Mortimer Levering Illustrating Subject	549
Rose Culture	749, 750, 758, 759
The Mammary Gland.	776, 777, 784, 785, 786
Smutted Corn Plants	834
" " Tassels	841
Relation of Smut Infection to Weather	848
Ears of Smutted Corn	850
Results of Artificial Infection	858
View of Piggery	883
Floor Plan of Piggery at Purdue	884
Isotherms for June, July and August	898
INDIANA ASSOCIATION OF VETERINARY GRADUATES	699
Annual Meeting	699
"Report of Ten Cases of Parturient Paresis Treated by Potassium Iodide," G. H. Roberts	699
List of Graduates	701
"Pneumonitis," F. W. Brewer.	703
Termination.	704
Symptoms.	705
Diagnosis Necessarily Grave	705
Treatment.	705
"Fistula," L. A. Greiner, V. S.	706
Etiology.	707
Infection—Sources	708
Modes of Entrance	709
Locating Factors.	710
Treatment.	711
INDIANA CORN GROWERS' ASSOCIATION—	
Organization	673
First Regular Meeting	673
President's Address.	673
Address of Governor Mount.	675
"Corn Culture and Its Commercial Value," E. S. Furzman.	676
"Observations on the Corn Plant," W. C. Latta	679
Constitution.	681
Articles of Association	681
Score Card.	682
Standard of Perfection	682
"Types and Varieties of Indian Corn," Prof. C. S. Plumb, Lafayette	683
"The Relation of Underdrainage to Corn Growing," J. J. W. Billingsley.	685
"Advantage of Score Card in Judging Corn," James Riley, Thorntown, Ind.	689
"Our Corn Production and Exports," J. G. Kingsbury.	690

INDIANA CORN GROWERS' ASSOCIATION—Continued.**PAGE**

"Some Mistakes in Corn Growing," E. H. Callom, Carmel, Ind 694

"Fertilizers for the Corn Crop," W. W. Stevens, Salem, Ind 695

Election of Officers 697

Members Who Were Active in Forming This Association 697

INDIANA HORTICULTURAL SOCIETY—

Program 584

President's Address 585

Report of Secretary 589

Treasurer's Annual Report 593

Vice-President's Report—First District 593

Vice-President's Report—Second District 594

Vice-President's Report—Third District 595

Report of Conditions and Prices in St. Joseph County, 1899 596

Report of Superintendent of Experiment Orchard 597

"Co-operative Horticulture," J. W. Morehouse, Albion 604

"Co-operative Shipping and Selling," J. W. Stanton, Illinois 607

"Plea for More Complete Organization of Horticulturists," J. C. Kimball, Ligonier 614

"Local Horticultural Society Program," J. C. Grossman, Wolcottville. 618

"Is Carolina Poplar Desirable for Street Planting," W. B. Flick, Lawrence, Ind 622

"Park and City Trees," J. P. Brown, Connersville 630

For Park Purposes 632

"Report of Committee on Experimental Orchard," Prof. J. Troop . . 632

Report of Committee on President's Address 634

Report of Finance Committee 634

"Value of Horticulture to Public Institutions," Amos W. Butler . . . 634

"To Create a Better Sentiment in Improvement of School Grounds," Lawrence Turner, Anderson 642

"Some Good Trees for School Grounds," J. P. Brown, Connersville . . 646

"Origin and Development of the Apple," John Morgan, Plainfield . . 650

Election of Officers 657

"Essentials to Successful Fruit Growing," R. Morrill, Benton Harbor. 658

Report of Committee on Exhibits 662

Report of Committee on Resolutions 665

Meeting of Executive Committee, March 3, 1899 666

Meeting of the Board, August 10, 1899 666

Meeting of the Board, January 4, 1900 666

Report of St. Joseph County Society 667

Report of Noble County Society 667

Report of Johnson County Society 668

Report of Wayne County Society 668

Annual Session 669

Agriculture 669

INDIANA HORTICULTURAL SOCIETY—Continued.

Report of Wayne County Society—Continued.	PAGE
Fruits	669
County Fair	670
Strawberry Culture	670
Report of Monroe County Society	671

INDIANA LIVE STOCK SANITARY COMMISSION—

George W. Hall appointed a member	17
---	----

INDIANA SHORTHORN BREEDERS—

Summary of Proceedings	422
Proceedings in Detail	426
President's Address.	426
“Public Sale: Its Place in Business of Breeding Shorthorns,” by Mrs. Virginia C. Meredith.	430
“Experiment in Shorthorn Breeding,” by Artemus Smith	436
“Does Superior Breeding Insure Superior Merit in Feeding?” by Mortimer Levering, Lafayette, Ind	435
“A Visit to the Shorthorn Herds of Great Britain,” by Prof. C. S. Plumb, Lafayette, Ind	443
Reports of Committees	448
“The Shorthorn—General-Purpose Breed,” by W. S. Robbins	457
Election of Officers	461

INDIANA STATE BOARD OF AGRICULTURE—

Members of 1899.	3
Officers of 1899	3
Table of Officers and Premiums Paid	4-5
List of Members and Date of Service.	6-7-8-9
Constitution of	11 to 14
Reorganization of the Board	15
Report of Committee on Salaries	17
Reimbursement of Mr. Levering of \$18.04	18
D. M. Brown elected Janitor	19
Bids for Printing Premium List.	20
Annual Meeting Delegate Board	23
President's Address	24
Object of Meeting	24
All Are Interested	25
Encouraging Organization	25
Increase Its Usefulness	26
Most Successful Fair	27
Lack of Earnest Co-operation	28
The Press	29
Some Suggestions	30

INDIANA STATE BOARD OF AGRICULTURE—Continued.

	PAGE
Governor's Address	32
Secretary's Report	32
Financial Report	33
Report of General Superintendent of Grounds	36
Secretary's Report	38
Our Duties as Citizens to	44
Fair Dates	57
Uniform Entry Fees	59
Premium List—Department A, Trotting Horses	73
Department B, Horses	79
Department C, Cattle	84
Department D, Cattle, Dairy Breeds	89
Department E, Sheep	93
Department F, Swine	101
Department G, Poultry	107
Department H, Dairy and Creamery Products	119
Department I, Agricultural	120
Department J, Horticultural	126
Flowers, Plants	131
Department K, Bees and Honey	133
Department L, Art	134
Amusements and Advertising	59
Election of Officers	62
Report of Committee on President's Address	67
Report of Auditing Committee	68
Committee on Credentials	68
Election of Members of	71
Premium List	

INDIANA STATE DAIRY ASSOCIATION—

Officers	463
List of Members	464
Articles of Association of	467
Proceedings 10th Annual Convention	469
"Mixed Farming," T. S. Nugen, Lewisville, Ind.	470
Hogs	472
Manure	472
"Dairy vs. Beef" C. B. Benjamin, Leroy Ind	475
"Skim Milk for Pigs," H. W. Barker, Lafayette, Ind	480
"Sorghum, Oats and Peas," T. B. Woods, Lattaville, Ind.	487
"Place of Corn Fodder in Feeding Rations," Prof. T. F. Hunt, Columbus, Ohio	492
Nutrients in a Ton	496
Rations for Milk Cows	497

INDIANA STATE DAIRY ASSOCIATION—Continued.		PAGE
“ Advantage of the Creamery and Cheese Factory to the Community,” David Shellenberger, Dublin, Ind		506
President’s Address		516
“ Why have a Special Training for the Dairy,” by G. P. Newsom, Valley Mills		520
Live Stock Judging		523
Stock Breeding		523
Feeding		523
Milk Testing		524
Dairy Bacteriology.		524
“ Citizenship and the Industries,” Prof. F. T. Moran, Purdue University.		525
“ Evolution and Development of the Dairy Cow,” Mrs. Kate M. Busick, Wabash, Ind.		510
“ The Conformation of the Dairy Cow,” Mortimer Levering, Lafayette, Ind.		545
Report of Auditing Committee		553
Report of Committee on Resolutions		554
Election of Officers.		555
Amendments to Constitution		555
“ Moisture in the Curing Room,” S. J. Taylor, Logansport, Ind.		556
“ Milking Machines,” C. S. Plumb, Lafayette, Ind		559
“ The Why of Milk Testing,” H. E. Van Norma, Lafayette, Ind		565
“ Cheese Making on the Farm,” Anna M. Hull, Rowland, Ala.		573
Treasurer’s Report		575
Creamery Butter Statistics		578
Premium Awards		579
Butter Entries, State Fair.		579
Indiana Entries and Scores National Creamery Butter Makers’ Ass’n .		581
State Averages.		583
American Dairy Journals.		583
 INDIANA STATE LIVE STOCK SANITARY COMMISSION—		
Report of Work done from November, 1897, to November, 1898		713
Membership of Commission November, 1898		716
Report of Work done from November, 1898, to November, 1899		717
Membership of Commission November, 1899		720
 INDIANA WOOL GROWERS’ ASSOCIATION—		
President’s Address.		398
Treasurer’s Report		399
“ The Shepherds of Antiquity,” Miss Anna Matthews		400
Address by Governor Mount		405
“ Results with a Flock of Forty Ewes,” T. E. Bowles.		414
“ Importance of Purity in Breeding,” Prof. C. S. Plumb		415

J

	PAGE
Jack, William, "Manufacturing Hogs"	294
Jamison, John M., "Pig Growing"	280
Jamison, John M., "Some Points in Swine Breeding"	326

K

Kimball, J. C., "Plea for More Complete Organization of Horticulture"	611
Kingsbury, J. G., "Our Corn Production and Exports"	690

L

Latta, W. C., "Observations on the Corn Plant"	679
Latta, W. C., "Continued Effects of Fertilizing the Soil"	787
Latta, W. C., "Test of Corn Cultural Implements"	792
Latta, W. C., "Field Test of Wheat"	795
Levering, Mortimer, "Does Superior Breeding Insure Superior Merit in Feeding?"	438
Levering, Mortimer, "The Conformation of the Dairy Cow"	546
Louis, Theo., "Mature Breeding Animal"	332
Louis, Theo., "What the Hog Has Done for the Farmer"	365

M

Martindale, E. B., "Indiana State Fair; The Reciprocal Relations of Managers and the City of Indianapolis"	62
Meiasner, J. A., "Is Swine Business Likely to be Overdone"	286
Mitchell, Hon. Robt., "How to Run a Fair"	40
Meteorological Tables	722-728
Matthews, Miss Anna, "The Shepherds of Antiquity"	400
Meredith, Mrs. Virginia, "The Public Sale and Its Place in the Business of Breeding Shorthorns"	430
Moran, T. F., "Citizenship and the Industries"	525
Morehouse, J. W., "Co-operative Horticulture"	604
Morgan, John, "Origin and Development of the Apple"	650
Morrill, R., "Essentials to Successful Fruit Culture"	658

N

Newsom, G. P., "Why Have a Special Training for the Dairy?"	520
Newton, Geo. F., Vice-President's Report, Fourth District	596
Norton, Caldwell, "Developing Breeding Stock"	373
Nowlin, H. L., "Swine and Specialty"	299
Nugen, T. S., "Mixed Farming"	470

P

	PAGE
Peterson, P. W., "Breeding and Feeding Hogs"	358
Plumb, C. S., "Value of Succulent Food for Swine".	340
Plumb, C. S., "Importance of Purity in Breeding"	416
Plumb, C. S., "Visit to Shorthorn Herds of Great Britain"	443
Plumb, C. S., "Milking Machines"	559
Plumb, C. S., "Types and Varieties of Indian Corn"	643
Purdue University—Charles Downing Recommended as Trustee to	18

R

Riley, James, "Starting a Herd of Thoroughbred Swine"	284
Riley, James, "Advantages of the Score Card in Judging Corn"	689
Robbins, W. S., "The Shorthorn—the General-Purpose Breed"	457
Roberts, G. H., "Report of Ten Cases of Parturient Paresis Treated"	696

S

Shellenberger, David, "Advantage of Creamery and Cheese Factory to Community"	506
Smith, Artemus, "Experiments in Short Horn Breeding"	436
Stanton, J. W., "Co-operative Shipping and Selling"	607

STATE INDUSTRIAL ASSOCIATION—

Officers for 1900	10
Stevens, Mrs. W. W., Vice President's Report, 1st District	593
Stevens, W. W., "Fertilizers for the Corn Crop".	695
Stuart, William, "Rose Growing with Chemical Fertilizers"	745

SUBJECTS—

How to Run a Fair	40
Pointers for Fair People	40
Plan of Organization	40
Advertise in Newspaper	41
Prohibit Gambling	42
Our Duties as Citizens to State Board of Agriculture	44
Neglected Things by Managers of Fairs	51
State Fair, Reciprocal Relations of Managers and City of Indianapolis.	62
Indiana and its Progress since 1816	153
Physical Condition	153
Admission of Indiana into Union	154
Members of the First Constitutional Convention	155
Physical Map of Indiana	155
Map of Indiana, 1817	157
State House at Corydon, 1816	159
Early Timber Resources	160
Constitutional Elm, Corydon	161
Coal, Natural Gas, Petroleum, Stone and Clay	162
Debt, Taxation and Wealth	163

SUBJECTS—Continued.**Indiana and its Progress since 1816—Continued.**

	PAGE
Land Grants and Internal Improvements	164
Taxable Values	165
Actual Values	165
Permanent and Current School Funds	166
State Revenues	166
Interest Rate	166
Railway Construction and Value	167
Progress of Wealth	167
Agriculture and Manufactures	168
Beginning of Agriculture	169
Farm Implements	171
New Impetus to Agriculture	174
The Soils of Indiana	176
Agricultural Productions for Sixty Years	179
Growth of Live Stock Industry	179
Live Stock for Sixty Years	181
The Manufacturing Industry	182
Indiana Agriculture for 1899	186
Wheat Crop	186
Corn Crop	187
Oats Crop	188
Timothy and Clover	188
Live Stock	188
Dairy and Poultry	189
Farm and Domestic Labor	189
Summary for 1899	189
Statistical Tables—Wheat and Corn	190
Oats and Rye	192
Timothy and Clover	194
Irish and Sweet Potatoes	196
Horses and Mules	198
Cattle and Hogs	199
Sheep, Lambs and Wool	201
Butter, Cheese, Eggs and Poultry	203
Labor	205
"Breeds of Swine," A. W. Bitting	208
"Diseases of the Pig," A. W. Bitting	214
"Pig Growing—Suggestions to Beginners," John M. Jamison, Roxabell, Ohio	280
"Where and How to Select Breeding Animals," W. Arthur Ayres, Oakville, Ky.	282
"Starting a Herd of Thoroughbred Swine," Jas. Riley, Thorntown . .	284
Ration for the Pig	285

SUBJECTS—Continued.

	PAGE
"Is the Swine Business Liable to be Overdone?" J. A. Meissner, Reinbeck Iowa	286
General Principable Observed in Feeding Pigs	287
"Manufacturing Hogs," Wm. Jack, Martinsburg	294
"Why Do Hogs Get Sick," E. H. Collins, Carmel	296
"Swine a Specialty," H. L. Nowlin, Guilford	299
"The Hog and Its Management," M. Crumrine, Somerset	302
"Preparing Hogs for the Show Ring," I. N. Barker, Thorntown	304
"Shaping Stock for the Show Ring," J. B. Garten, Burney	305
"Do Public Sales Benefit the Breeder of Hogs," John M. Vance, Springport	307
"What Benefits are Derived from Breeders' Meetings," L. Arbuckle, Hope	308
The Care of Pigs.	309
Weaning Pigs	311
Whole vs. Ground Feed for Hogs	312
The Hog Dog	313
Management and Feeding of Fall Pigs.	315
"Fattening Hogs for Market," J. H. Bone, Lafayette	316
A Word for the Hog Wallow	317
Crossing Breeds	318
Sure and Quick Returns	319
Feeding Show Pigs.	320
"Do Public Sales Benefit the Breeder?" A. Arthur Ayres, Oakville, Ky.	322
What is the Score Card?	323
"Some Points in Swine Breeding," J. M. Jamison.	325
Feeding Wheat	331
"Mature Breeding Animals," Theo. Louis, Dunn County, Wis	332
Feeding the Brood Sow	334
Hog Cholera Cures.	336
"How to Care for Brood Sows," D. J. Green, Noble County, Ohio.	338
"Value of Succulent Food for Swine," C. S. Plumb, Purdue University.	340
Poor Stock	350
"Best Summer Pastures for Hogs," H. Z. Churchill, Elizabethtown, Ky.	352
"Streaks of Lean," I. N. Cowdry, Gratiot County, Mich	357
"Conveniences for Handling Hogs," W. A. Hart, Portland, Ind.	358
"What the Hog Has Done for the Farmer," Theo. Louis, Dunn County, Wis.	365
"Treating Thumps in Pigs," W. S. Haley, Wilson County, Tenn	366
How Long to Feed Hogs	367
"Breeding and Feeding Hogs," P. W. Peterson, Vermillion, S. D	368
"Value of Pure-Bred Hogs for the Market," J. O. Hibbs, Vine Grove, Ky.	371
"Developing Breeding Stock," C. Morton, Louisville, Ky	373

SUBJECTS—Continued.

	PAGE
"American Swine," J. R. Dodge, Washington, D. C	374
"Young or Old Sows for Breeders," Sam Clark	376
Rape for Swine Feeding	376
Sleeping Quarters for Swine.	377
"What Becomes of the Hog When It Reaches the Packing House" . .	378
"The Shepherds of Antiquity," Miss Anna Matthews, Brooklyn, Ind .	400
"Results with a Flock of Forty Ewes," T. E. Bowles, Noblesville, Ind .	414
"Importance of Purity in Breeding," Prof. C. S. Plumb, Lafayette, Ind .	416
"Public Sale—Its Place in the Business of Breeding Shorthorns," Mrs. Virginia C. Meredith	430
"Experiments in Shorthorn Breeding," Artimus Smith	436
"Does Superior Breeding Insure Superior Merit in Feeding?" Mortimer Levering, Lafayette, Ind	438
"A Visit to the Shorthorn Herds of Great Britain," Prof. C. S. Plumb .	443
"The Shorthorn—General Purpose Breed," W. S. Robbins	457
"Mixed Farming," T. S. Nugen, Lewisville, Ind	470
"Dairy vs. Beef," C. B. Benjamin, Leroy, Ind	475
"Skim Milk for Pigs," H. M. Barker, Lafayette, Ind.	480
"Sorghum, Oats and Peas," S. B. Wood, Lattaville, Ind	487
"Place of Corn Fodder in Feeding Rations," Prof. T. F. Hunt, Colum- bus, O	492
"Advantage of the Creamery and Cheese Factory to the Community," by O. Shellenberger, Dublin, Ind	506
"Business Side of Dairying," J. J. W. Billingsley, Indianapolis . . .	516
"Why Have a Special Training for the Dairy," by G. P. Newsom, Val- ley Mills	520
"Citizenship and the Industries," by Prof. T. F. Moran, Purdue Uni- versity	525
"Evolution and Development of the Dairy Cow," Mrs. Kate M. Busick, Wabash, Ind	540
"The Conformation of the Dairy Cow," Mortimer Levering, La- fayette, Ind	546
"Moisture in the Curing Room," S. J. Taylor, Logansport, Ind . . .	556
"Milking Machines," C. S. Plumb, Lafayette	559
"The Why of Milk Testing," H. E. Van Norman, Lafayette	566
"Cheese Making on the Farm," Anna M. Hull, Rowland, Ala	573
"Co-operative Horticulture," J. W. Morehouse, Albion	604
"Co-operative Shipping and Selling," J. W. Stanton, Illinois.	607
"Plea for More Complete Organization of Horticulturists," J. C. Kim- ball, Ligonier	611
"Local Horticultural Society Program," J. C. Grammar, Wolcott- ville, Ind	618
"Is Carolina Poplar Desirable for Street Planting?" W. B. Flick, Lawrence	622
"Park and City Trees," J. B. Brown, Connersville	630